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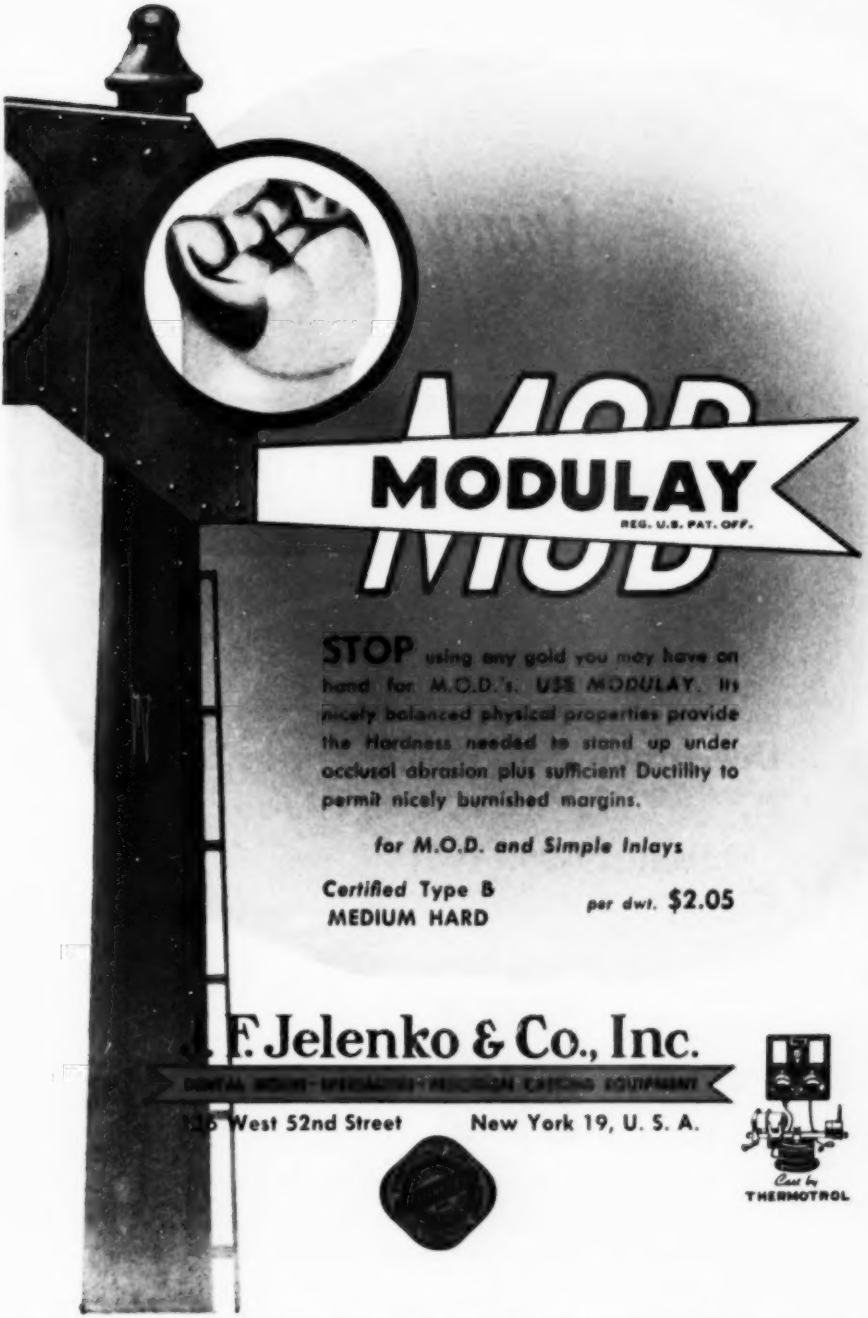
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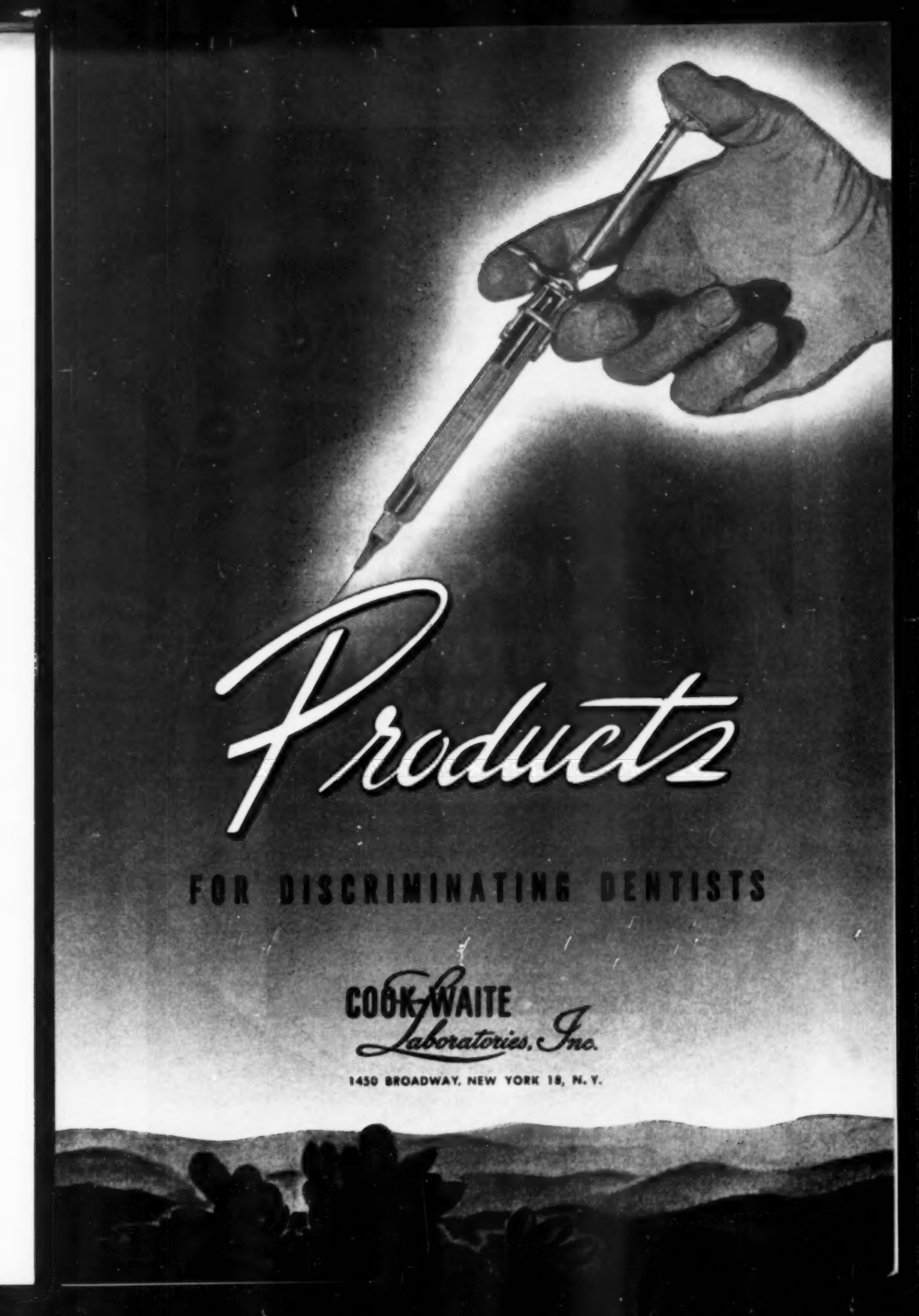
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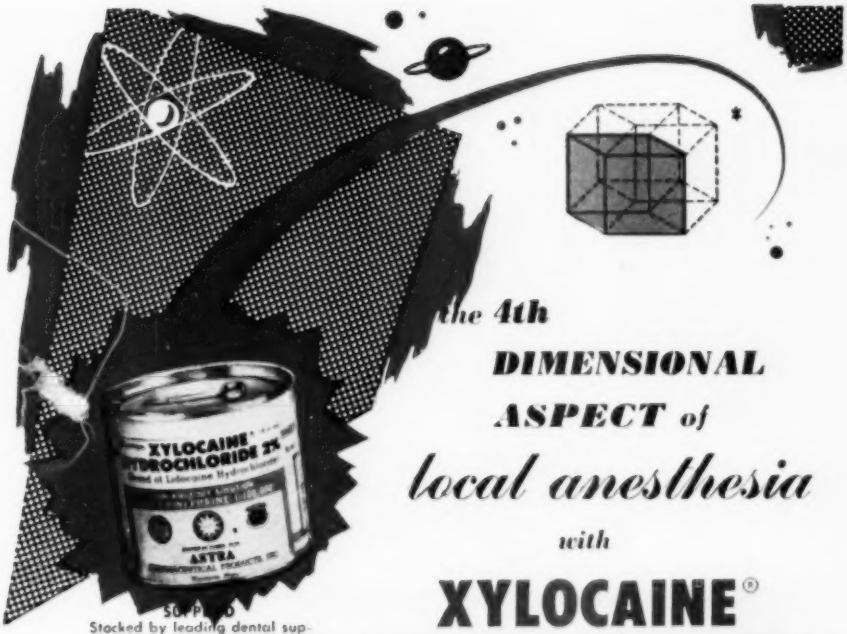

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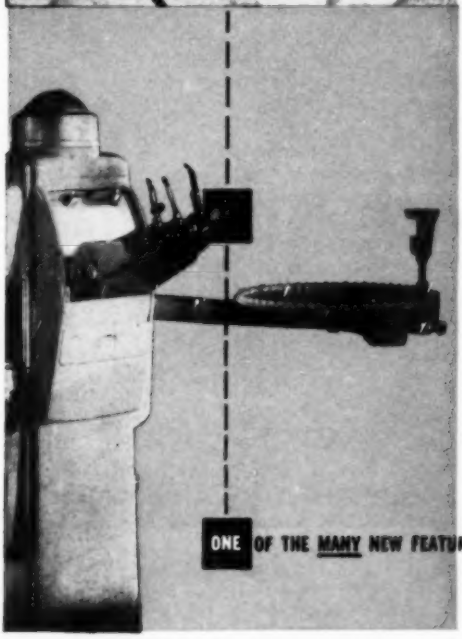

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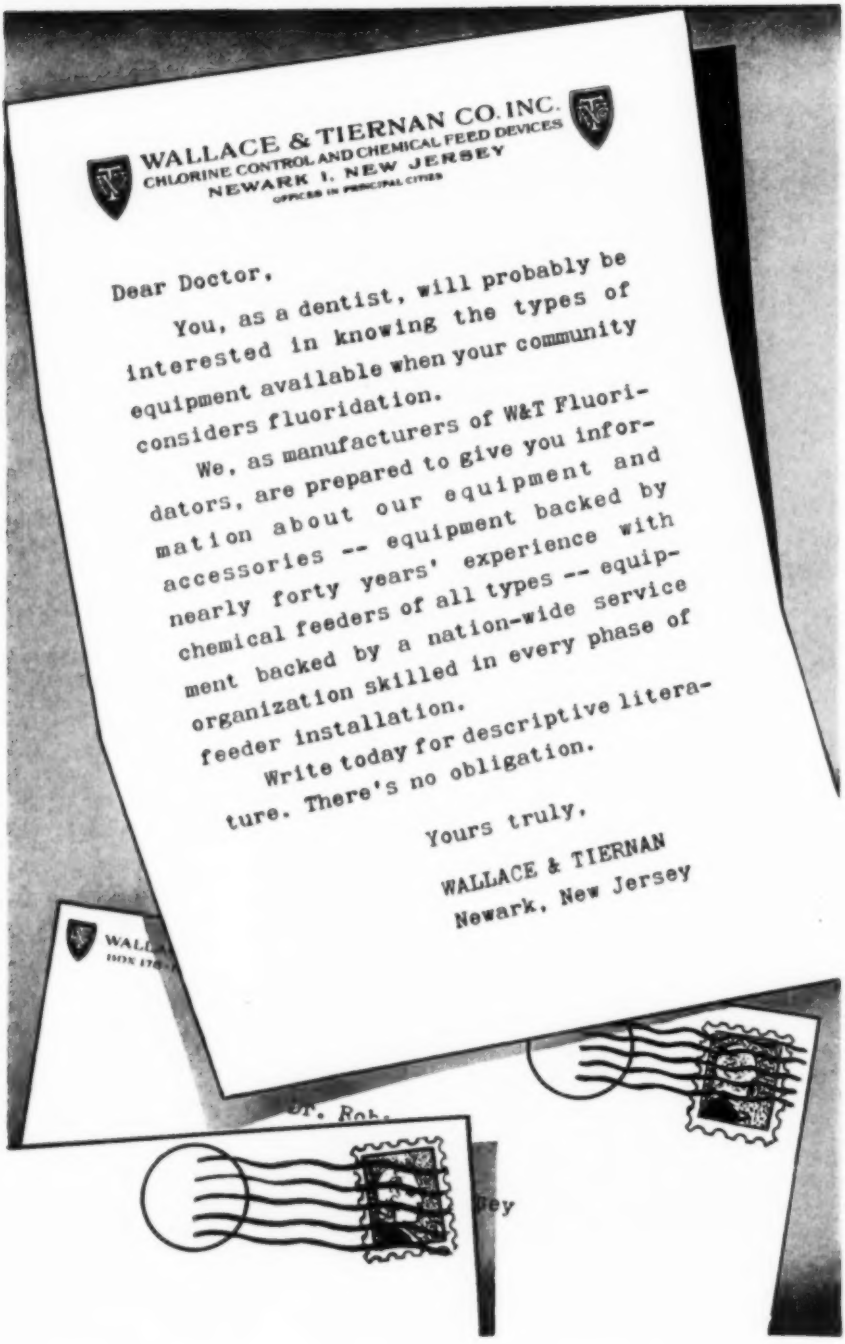
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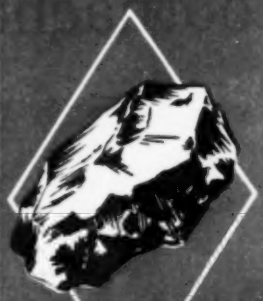

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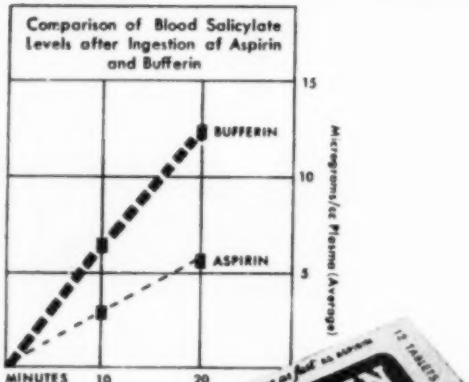

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New dental uses of radioactive materials

In this issue of THE JOURNAL, several new departures in the use of radioactive materials in dentistry are presented. These include such varied applications as the taking of roentgenograms without an x-ray machine, the determination of growth sites in the jaws and skull with radioactive calcium, the testing of the seal of the margin of acrylic fillings, the use of radioisotopes in the study of radiation injury, and the determination of the retention of radioactive iodine in teeth of patients treated for thyroid disease. Lastly, a report from the Council on Dental Research on a survey of the uses of radioactive materials is included (page 656).

The opening of the Pandora's box of atomic energy, although it has provided mankind with tremendously destructive tools, has at the same time provided dentistry with fascinating possibilities for the development of new clinical technics and materials.

A number of dentists have inquired as to how to use the new tools of radiobiology and how to start investigations with them. The first way to start is to study at home; for example, to read the articles in the dental and biological literature listed in the Council report in this issue. Even with meager preparation, it is possible to obtain valuable information from extracted teeth of patients who have been treated with radioactive iodine. Bartelstone has described investigations of this type (see reference list in the Council report). Study of such teeth offers several advantages since the dentist does not have to handle the isotope and the teeth obtained from these patients are not so radioactive as to be dangerous. There will be no burning of the fingers, for example, and the dust caused by grinding, although it contains some radioactive iodine, has so little and its radioactivity is lost so rapidly that it is not a hazard. When sections of these teeth are pressed against dental x-ray film, an exposure is

made which will produce valuable information regarding the permeability of normal and carious teeth. In order to carry on such investigations, however, it is valuable to have association with a hospital using isotopes for therapy or with some isotope therapy unit.

As experience is gained, the next step for the dentist is to take short courses such as those given at the Oak Ridge Institute of Nuclear Studies. Of necessity, the last method is reserved for those few younger men who can devote several years to graduate study. If this is possible, there are several universities where adequate training can be obtained.

The lines of dental research already anticipated in the early-forties, before the advent of isotopes from the uranium pile, were in themselves enough to entice the dental investigator into the field of radioactivity. The developments which have occurred since 1945, when radioactive compounds were released in large quantities from the uranium pile at Oak Ridge, have each year brought new developments in dentistry, and it appears now that dental institutions will need to establish radioisotope laboratories where graduate students can be trained in the use of these new tools of dental science.

Production of roentgenograms by x-ray radiations obtained from radioactive x-ray emitters

Harry D. Spangenberg, Jr., D.D.S., M.S.D., and M. L. Pool,† Ph.D., Columbus, Ohio*

Dental roentgenograms have been taken, under experimental conditions, without the aid of an x-ray machine. Harry D. Spangenberg and M. L. Pool of Ohio State University have found radioisotopes which act as sources of radiation similar to that produced by the dental x-ray machine. In their experimental technic, demonstrated on a skull, the x-ray source was so small and compact that it could be placed inside the mouth, thereby avoiding the confusing shadows caused by such superimposed bony structures as the zygomatic arch. Drs. Spangenberg and Pool point out that newly available isotopes may make possible the practical application of this technic. Armed forces in the field may find that this means of taking dental roentgenograms offers intriguing possibilities. No electrical generator or bulky transformers are needed, and the source is small and of light weight. Many new clinical technics are possible since the small source may be placed inside body cavities for new types of projection onto x-ray film.

It is well known that x-rays are produced by the utilization of a vacuum x-ray tube and a high voltage power supply. It is not commonly known, however, that recent discoveries have shown that nuclei of certain atoms are an exciting source of x-rays.[1] No vacuum tube is required, and no high voltage is necessary. These nuclei, of their own volition and without any outside influence whatsoever, cause the emission of x-rays whose intensity is directly proportional to the number of nuclei present.

It is the purpose of this paper to point out what the scientific nature of the phenomenal x-ray emitting process really is, what dental research uses have been made to date of these new x-ray sources,[2] and what practical developments now seem possible.

THE RADIOACTIVE X-RAY EMITTING PROCESS

K-Capture Process • It is necessary to understand certain fundamental concepts about the nucleus of the atom itself in order to understand how the nuclei of these newly discovered x-ray emitting atoms operate and to understand that they have no relationship with the *modus operandi* of current commercial dental, medical or industrial x-ray equipment. According to the Bohr theory, an atom may be likened to the solar system. The sun corresponds to the nucleus, and the planets correspond to the electrons. In the conventional commercial dental x-ray tube, the production of x-rays results from a collision of electrons accelerated from the hot filament by approximately 65 kv., with the "solar" electrons of the atoms in the target of the x-ray tube. In the colliding process, the impacts are not recorded as sound waves but as electromagnetic waves of a variety of lengths. If the violence of the impact is increased, the electromagnetic waves which are produced are shorter and more penetrating. Sometimes the collision between the fast-moving electrons and the electrons of the target is head on and sometimes glancing. Consequently, a variety of different length waves are produced during the operation of an x-ray tube. Such a mixture of waves is commonly described as "white" radiations. In a beam of "white" radiations produced by a dental x-ray tube energized by 65 kv., the average wave length is approximately 0.4 Angstrom units, the hard component between 0.4A and 0.189A and the soft component between 0.4A and 1.0A. The newly found natural radioactive x-ray emitters do not produce a mixture of waves as the x-ray tube does, but rather a wave of essentially a single length. These x-ray beams of single wave lengths are characteristic of the nuclei of the atoms which make up the source and cannot be changed by any known means to date. Furthermore, the waves are not affected by any chemical combination or state, be it liquid, solid or gaseous.

The unusual behavior of the nucleus may be understood more easily by examining what occurs in a single specific nucleus from the time it is purchased in a chemical supply store to the time that it becomes a radioactive x-ray emitter. Barium oxide is an example of such a chemical. The oxide is readily available, but what will occur is independent of its combination with oxygen and would have occurred also were it combined with any other anion. The barium oxide is irradiated with neutrons in a nuclear reactor such as the one at Oak Ridge or at Chalk River, or it is bombarded with deuterons in a cyclotron. As a result of this treatment, the barium nucleus of mass number 130 acquires an extra neutron and be-

*Associate professor of dentistry, The Ohio State University, College of Dentistry.

†Professor of physics, The Ohio State University.

1. Pool, M. L. Radioactive x-ray emitters. Phys. Acta 23: 178, Sup. 3, 1949.

2. Spangenberg, H. D., Jr. Production of roentgenograms by means of x-ray radiation from artificial radioactive isotopes: a preliminary report. Ohio State Engr. Expt. Sta. News 20:48 Dec. 1948.

comes a nucleus of mass one unit heavier, 131. This new nucleus now transforms itself into the nucleus of the element, cesium. Cesium nuclei have a half-life of 9.6 days, which means that on the average, half of the cesium nuclei thus produced will be transformed into something else in 9.6 days. It is the transformation process that is responsible for the production of x-rays. The cesium nucleus consists of 55 protons and 76 neutrons, a total of 131 particles. The nucleus occupies a very small bit of space when compared with the atom as a whole, which includes not only the nucleus but also the electron system. The two electrons in the K-orbit, the orbit nearest the nucleus, are very far away on the atomic scale of distance. Nevertheless, within 9.6 days, one half of all the cesium nuclei have reached out and captured for self-consumption one of the electrons in its own K-orbit. Biologically speaking, it may be said that the exact metabolic process is not clearly understood. After the digestive process, however, the nucleus no longer belongs to the chemical family of cesium atoms, but to the family of xenon atoms instead. The xenon nucleus has 54 protons and 77 neutrons, still a total of 131 particles.

Before the capture of one of the electrons in the K-orbit, the number of electrons in the electron structure is 55. After the process there are only 54. It is highly probable that one of the electrons in the orbit nearest the K-orbit, that is the L-orbit, would fall into the vacant space in the K-orbit. When transposition in position of the electron takes place, a certain definite amount of energy is released, just as a certain definite amount of energy is released when a pound of mass is dropped from the second floor to the first. Instead of emitting sound on the release of this energy, electromagnetic radiations are produced whose wave length is related to the energy difference between the L-orbits and K-orbits. Because of this relationship the wave length of the x-ray radiation is characteristic of the atom from which it comes. The precise energy difference between the L-orbits and K-orbits of the atoms of each chemical element in the periodic table increases monotonically from the lightest to the heaviest element. Since this is true, the wave length of the x-rays produced is characteristic, therefore, of the element from which they come. The characteristic radiations of cesium differ from those of copper, silver or tungsten.

Internal Conversion Process • X-rays may be emitted by radioactive atoms by quite another process—the phenomenon of the internal conversion of nuclear gamma rays.

In this process a nucleus is about ready to emit a certain amount of energy by the more common gamma-ray emission mode. This does not always occur, however, because of certain forbidding regulations within the nucleus. These regulations are very firm in some nuclei and lax in others and are not clearly understood. Only the results are observed. The observation is: An electron is emitted from the atom with an energy nearly equal to the energy of the gamma ray that would have been emitted from the nucleus. The ejected electron originated from the K-shell. Thus the energy which was to have been released from the nucleus in the form of an electromagnetic radiation (gamma ray) was, however, released in the form of kinetic energy imparted to a K-electron.

Thus the K-orbit now is deficient by one electron. This is exactly the same situation that existed subsequent to K-electron capture, previously explained, and the emission of an x-ray now follows in a manner which also was previously explained. Nuclei which thus would like to emit gamma rays actually accomplish only x-ray emission characteristic of the atom concerned.

As a result of these phenomena, a source of x-ray radiation is available

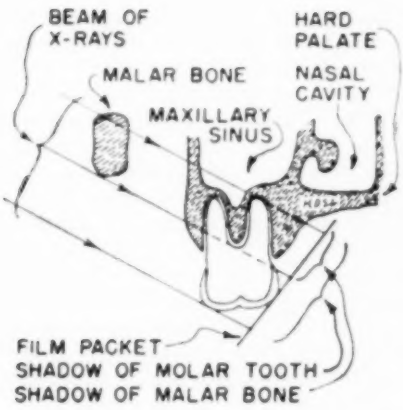

Fig. 1 • Cross section of half of upper jaw through second molar

which requires no x-ray tube and no high voltage equipment. Since the source of the radiations which originate in radioactive x-ray emitters is minute, it becomes possible to place such a source of x-rays within the mouth or other small cavities of the body in order to visualize structures from positions heretofore impossible.

EXPERIMENTAL PROCEDURES AND RESULTS

Figure 1 illustrates the relationship which exists between the film packet placed in the upper molar region and the position of the source of the x-ray beam from a commercial dental x-ray tube. Figure 2 illustrates the relative position of the film packet and the radioactive x-ray emitter. It will be noticed that with this new positioning, it becomes possible to visualize the molar region without superimposing the shadow of the malar bone over the shadows of the apexes of the teeth. Figure 3 illustrates a roentgenogram produced by the technic illustrated in Figure 2. Since a skull was used for this purpose, there is a slight alteration in the appearance of the trabeculae of the alveolar process which is observed in roentgenograms of living people. The difference of appearance is not related to the x-ray source. It may be observed that while the trabecular bone is nicely visualized, some underexposure of the crowns of the teeth exists with resultant loss of detail. Figure 4 illustrates the possibilities of visualizing entire segments of jaws without the usual superimposition of confusing shadows that occurs in all extraoral technics, with the exception of those roentgenograms produced by use of the laminagraph. It will be noticed also that the temporomandibular joint is visualized without superimposed confusing shadows. Again, the penetration of the x-rays was not sufficient to produce perfect visualization. On the other hand, the ascending ramus and body of the mandible are somewhat overexposed.

The radioactive material used in the production of Figures 3 and 4 was mounted on a wooden applicator stick whose diameter was approximately 0.7 mm. The surface of the radioactive material was rounded up in much the same fashion as is the head of a match. Since the radiation was very weak, no shielding was necessary for the safe handling of the material. The exposure time necessary to blacken the films was long. Figure 3 required approximately 11 hours of exposure time and Figure 4, one week. Fig-

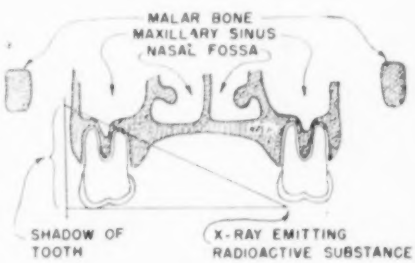

Fig. 2 • Cross section of entire upper jaw through second molar

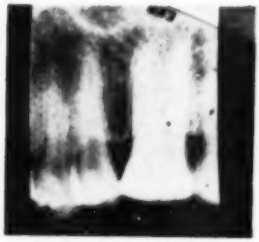

Fig. 3 • Roentgenogram of tooth, taken using radioactive cesium positioned as illustrated in Figure 2

ure 3 was exposed during the first 9.6 days after the bombardment of the radioactive material, and Figure 4, after 9.6 days.

DISCUSSION

By positioning the source of x-ray radiations within the oral cavity, unusual visualization of the teeth and jaws has been demonstrated. In both of the films illustrated, the x-ray emitter was not more than 4 cm. from the film. While one of the disadvantages of the short-target film technic is inherent with intraoral placement of the x-ray emitter, nevertheless, certain advantages are obtained. There is an absence of superimposition of confusing shadows. This is a decided advantage. It may be observed that each technic possible with the conventional commercial x-ray equipment also may be duplicated with the natural radioactive x-ray emitters. The distinct advantage of being able to place the x-ray emitter within the oral cavity permits additional technics. From a diagnostic point of view, this is important, for the more information that can be obtained, the more accurate is the diagnosis.

The conventional commercial x-ray equipment has to be shielded to prevent stray radiations. This is equally true of the radioactive x-ray emitter. With the radioactive x-ray emitter, however, there is no problem of protection from high voltage shock. X-rays become available, after proper adjustment of commercial x-ray equipment, when the interval timer button is pressed. Since x-rays are constantly being produced by the radioactive x-ray emitter, the exposure time can be controlled by mechanically removing part of the shielding for a predetermined interval.

The intensity of x-ray radiations from the conventional commercial x-ray tube varies considerably, depending on the x-ray tube itself and the external filtration factors such as the plastic cone and thin aluminum filters. At 8 inches from the target, the roentgen units per second vary from approximately 2.6 to 1.2. In comparison, the output from the radioactive x-ray emitters used in this study was very weak. When a skull is used as a subject, the exposure time is not critical. From a clinical point of view, however, intensities of radiation should be such as to permit the use of a reasonable exposure time which would be of the order of approximately 3 seconds when an intermediate speed emulsion is used. This is entirely possible with newly available radioactive sources.

To expose a dental film adequately, about seven roentgens are required at 65 kv. In radioactivity the unit "curie" is used which means 3.7×10^{10} disintegrations occur per second. Since the roentgen unit means 83.8 ergs of energy dissipated in 1 Gm. of air, there is no direct simple relationship between roentgens and curies. The relation involves the absorption coefficients of x-rays in air. These coefficients vary from about 0.4 $cm.^2$ per gram to 0.17 $cm.^2$ per gram in the useful x-ray wave length region. There is no fixed number of curies which will produce seven roentgens. The number of curies required to produce a roentgen is dependent on the individual radioactive emitter. Nevertheless, to produce seven roentgens, calculations indicate that sources of several curies intensity are re-

quired. The requirement seems quite within practical attainments with the nuclear reactors now available. Gamma-ray and beta-ray emitting sources in the thousands of curie intensity level are listed in a current catalogue of readily supplied radioactive substances.[3]

The half-life of cesium is 9.6 days. This is an unsatisfactory quality since, from a clinical point of view, it would mean the replacement of the radioactive source every nine days or else prolong the exposure time beyond practical limits. There are many newly available radioactive sources yet to be explored which would effectively eliminate this problem.

The relationship which exists between wave length, penetration and roentgenographic contrast is well known. It would appear that characteristic radiations from a natural radioactive x-ray emitter shorter than 0.4A might produce a roentgenogram with slightly less contrast and with greater detail. Both qualities are important. It lies within the realm of distinct possibility that shorter x-rays might produce better over-all results. Although roentgenographic contrast and detail also may be a function of the type of emulsion, the chemical makeup of the developer and the developing time, a study of these relationships has not been a part of this investigation.

The only equipment necessary for production of clinical roentgenograms by use of radioactive emitters is very small and light in weight as compared with the conventional commercial x-ray equipment. It would appear that this might be a decided advantage from a military point of view. X-ray equipment requir-

3. Catalogue B, Eldorado Mining and Refining, Ltd., Ottawa, Canada, 1944.

Fig. 4 • Roentgenogram of body and ascending ramus of mandible, maxilla, malar bone, temporal bone and mastoid process produced by radioactive cesium positioned as illustrated in Figure 2. The radiopaque line extending superiorly from tip of coronoid process is a spring used to hold mandible to skull.

ing no source of electricity, no high voltage transformers and having no bulk may prove to be of real advantage, in addition to the fact that the x-ray source may be inserted within the mouth or within any other cavity of the body. By use of such technics, new roentgenographic visualizations are possible which have the potential of broadening diagnostic horizons.

SUMMARY

Experimental roentgenograms of a skull have been made by using a small radioactive x-ray emitter as a source of x-rays. The small intensities of x-rays produced do not permit of its clinical use at present. It is a distinct probability, however, that further investigation will lead to the discovery of other radioactive x-ray emitters which will produce an x-ray beam of sufficient intensity and of proper wave length and one which will have a long enough half-life to make possible its clinical use as a source of x-ray radiations. Since such sources are minute, they may be placed within any cavity of the body in order to obtain roentgenographic visualizations heretofore impossible. Furthermore, the minute radioactive x-ray source, the shielding equipment and the interval time exposure device, is so small and light in weight that it is readily transportable.

Radiobiology of the oral tissues

M. S. Burstone, D.D.S., Chicago

M. S. Burstone, of the University of Chicago, reviews the available information on injury to oral tissues caused by radiation. He summarizes the ways in which radioisotopes are used in experimental studies of cellular injury. The changes produced by radiation lead to cell death, alterations of organ function, and in some instances to neoplastic growth. Dr. Burstone summarizes the theories of injury to oral tissues by penetrating radiation and draws from personal experience for brief descriptions of the types of injuries produced.

In recent years the use of radioactive tracers as indicators of biological activity has yielded fundamental information on the growth and development of living organisms. In addition to tracer research, radiation sources, including radioactive substances, also constitute a valuable biological tool because of their direct effect on tissue functions.

Ionizing radiation affects organisms in many ways. Radiation not only causes tissue death but also may induce tumors and mutations, thus playing an important role in the destruction, alteration and evolution of life. Although certain

Department of anatomy, University of Chicago.

chemical agents may produce cellular changes similar to those produced by radiation, the latter represents a unique biological tool for the study of growth. In contrast to radiation effects on cells, the action of chemical agents may be somewhat limited because of selective passage through the cell membrane. Moreover, the use of a microbeam of ionizing particles such as protons has made it possible to irradiate parts of individual cells.[1]

Differences in the radiosensitivity of cells and tissues are not a matter of academic interest only. Differences in radiation sensitivity, for example, between neoplastic and normal tissues have long been the basis for radiation therapy. Unfortunately many aspects of such therapy are largely empirical since the biological mechanisms underlying radiation change are only partially understood. Intensive study of the pathogenesis of tissue changes was undertaken during the war since it was thought that the Germans might use "radioactive poisons" as a new type of chemical warfare agent.[2] Also it was undertaken in anticipation of the time when large amounts of nuclear energy would be released explosively, thereby subjecting living organisms to various types of radiant energy. Part of this study has been published in book form and deals with the effects of x-ray and ionizing radiation from radioactive substances on various tissues and organ systems of laboratory animals.[3] Unfortunately the oral cavity, including the teeth and salivary glands, was not studied.

What is ionizing radiation? In brief, ionizing radiation constitutes those portions of the electromagnetic spectrum and also particulate forms of radiation (such as alpha and beta particles and neutrons) which carry enough energy to produce ionization in substances which absorb them. Units of dosage of ionizing radiations such as x-ray, and also those emitted by radioactive materials, have been arbitrarily adopted. The roentgen (r), the unit of dosage for x-rays, represents the amount of x-radiation which will produce a certain state of ionization in a cubic centimeter of air under standard conditions of pressure and temperature. Therefore the roentgen is not a unit of biologic dosage, but rather an arbitrary standard. The radiations emitted by radioactive substances are measured in terms of the rate of disintegration per unit time, the curie. The curie which signifies 3.7×10^{10} atomic disintegrations per second has subdivisions; the millicurie (0.001 curie) and microcurie (0.000001 curie) respectively.

The biologic effects of radioactive materials are related to the rate of disintegration and to the period of time during which these substances produce ionizing emanations. To understand this relationship it is necessary to introduce the concept of half-life. The half-life of a radioactive substance is the time required for a breakdown or decay of half of the original radioactive material. For example, strontium^{90} has a half-life of 30 years. Two microcuries of this substance, metabolized in the human body, would be dangerous to life. On the other hand, radioactive phosphorus, P^{32}, has a half-life of 14 days. Two microcuries of this substance would be of little consequence to the health of the individual.

As previously indicated, the mode of interaction between radiation and protoplasm is only partially understood. There is little doubt, however, that these changes are mediated, at least in part, by the energy transformation involved in the absorption of ionizing radiation. Since cell damage and even death can be caused by absorption of very small amounts of radiant energy, it is probable that the effects on the biological ac-

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tivities of cells are not proportional to the number of molecules affected, but rather are dependent on the disruption of certain specific molecular groups. Neutron bombardment, for example, may change nitrogen atoms into carbon atoms, and such a situation occurring in chromosomes may very well alter the genetic make-up of the organism.[4]

In vitro studies have demonstrated that macromolecules such as desoxyribonucleic acid (DNA) can be depolymerized by irradiation,[5] and the splitting of hemocyanin molecules also has been demonstrated.[6] More recently, histochemical studies have suggested that x-ray irradiation of the lens of the eye results in a depolymerization of polysaccharide-protein complexes.[7]

A second mechanism by which radiation interacts with living cells involves effects on the intercellular substrates. It is well known that ionized water molecules form hydrogen peroxide.[8, 9] This change, plus other factors such as the formation of hydroxyl radicals and partially degraded molecules, may be responsible for altering the normal physiological processes of cells. In reference to substrate changes, recent work has indicated that administration of cysteine will increase the radiation tolerance of animals presumably by altering the tissue substrate.[10]

A third but not entirely separate mode of action deals with effects on the genetic make-up of the cell. Since observable radiation-induced genetic changes are well known, it is reasonable to assume that some of the physical and chemical changes discussed may well involve the submicroscopic genetic pattern of the irradiated cell. This in part may explain the striking morphological changes which result from the very small amount of energy interacting with the cell.

Thus intimately related to these physico-chemical changes may be the gross and microscopic characteristics of irradiated tissues.

One of the very early experimental studies with x-rays revealed that irradiation would result in a retardation of the dentition as well as in retardation of facial development.[11] Subsequent histological studies by Leist[12] and Smith[13] revealed that irradiation of the dentition of rats resulted in a disorganization of the odontoblasts with formation of atypical dentin in the pulp chamber. The ameloblasts, enamel, and cementum were not affected. This work suggested that the odontoblast is more radiosensitive than the ameloblast. More recent experimental studies have confirmed these earlier findings and also have elaborated on the pathogenesis of radiation changes involving the teeth and jaws.[14-17] Irradiation of the developing molar teeth of mice may result in the absence of root formation and in the development of abnormal dentin within the pulp chamber[15, 16]

4. Lapp, R. E., and Andrews, H. L. Nuclear radiation physics. New York, Prentice-Hall, Inc., 1948, p. 433.

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6. Svedberg, T., and Brohult, S. Splitting of protein molecules by ultraviolet light and x-rays. Nature 143:938 June 3, 1939.

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13. Smith, Richard A. The effect of roentgen rays on the developing teeth of rats. J.A.D.A. 18:111 Jan. 1931.

14. Burstone, M. S. The effect of x-ray irradiation on the teeth and supporting structures of the mouse. J.D. Res. 29:220 April 1950.

15. Burstone, M. S. The effect of radioactive phosphorus upon the development of the teeth and mandibular joint of the mouse. J.A.D.A. 41:1 July 1950.

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17. Medak, H., and others. The effect of single doses of irradiation upon the tissues of the upper rat incisor. J.D.Res. 31:559 Aug. 1952.

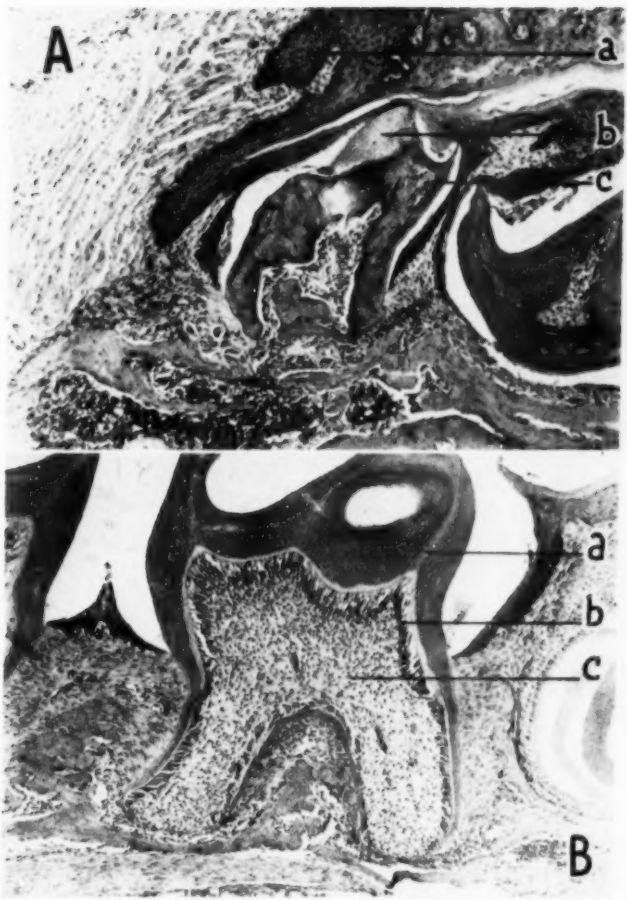

Fig. 1 • A: Abnormal second molar tooth of 23 day old mouse, 21 days after radioactive gold had been injected into an adjacent region. There is complete failure of root formation. (a) oral epithelium; (b) enamel matrix; (c) abnormal dentin. B: Second molar tooth of normal control animal. Note regular tubular structure of dentin and well developed morphological outline. (a) dentin; (b) odontoblasts; (c) pulp. (Courtesy of Archives of Pathology)

(Fig. 1). However, the crown of the tooth continues to develop after exposure. This suggests that histodifferentiation of odontoblasts is inhibited by damage to the sheath of Hertwig. Thus the pathogenesis of some clinically observed effects of irradiation, such as delayed eruption and absence of root formation, may be better understood.[18]

The formation of abnormal dentin within the pulp chamber after irradiation may serve as a "biologic tool" for the study of abnormal dentin formation. Administration of radioactive materials constitutes a precise method for production of abnormal dentin associated with odontoblasts as well as with connective tissue cells of the pulp.[15] Furthermore, molar teeth of young mice particularly lend themselves to study by some of the newer histochemical methods since these immature teeth and supporting hard tissues may be sectioned without decalcification.[19]

The pathogenesis of radiation effects on bone has been reviewed in a recent book edited by Bloom.[3] Radiation from x-rays and also from internally administered radioactive materials results in damage or death to osseous tissues and an atypical repair process. After administration of certain radioactive isotopes, this repair process is most striking in that it is characterized by the development of a "gelatinous" marrow containing abnormal reticular cells rich in glycogen.[20] Subsequently, foci of atypical immature bone form adjacent to the damaged epiphyseal cartilage. This formation may retard or prevent normal intracartilaginous bone development and result in a decrease or cessation of growth. Hemiatrophy of the mandible after unilateral irradiation has been observed clinically[21] and experimentally,[22,16] and the pathogenesis of this condition may be clarified readily on the basis of the experimental evidence discussed.

Irradiation of the jaws usually involves the salivary glands, and some degree of xerostomia with a thick ropy saliva may ensue. Routine histological examination of salivary gland tissues of these patients reveals no immediate changes. Eventually atrophy of the glandular epithelium and a fibrosis develop.[23] Use of histochemical technics such as fixation by freezing and drying in conjunction with the periodic acid-Schiff method has demonstrated early radiation changes which cannot be visualized with routine histological staining methods. Experimental findings have revealed that one week after local irradiation of the sublingual (mucous) and submaxillary (serous) salivary glands, there is a very great decrease in the number of granules (secretory precursors) of the submaxillary gland as compared to the sublingual[24] (Fig. 2). This indicates that the submaxillary gland exhibits the greater radiosensitivity, and may clarify the pathogenesis of the clinical syndrome characterized by decreased salivary function and a thick mucinous saliva.

SUMMARY

Ionizing radiation furnishes a biological tool for the study of growth. Since radiation sources such as electrons or protons constitute the "building blocks" of matter, and since they are not retained by the cell (unless assimilated as radioactive material), their effects may be more amenable to analysis than tissue changes

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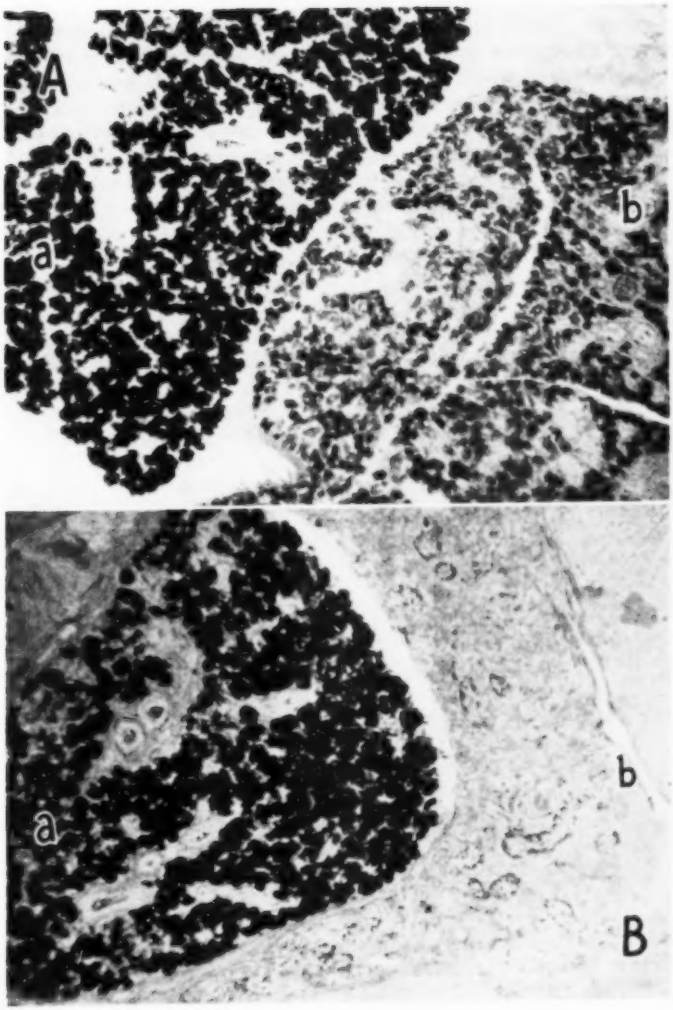

Fig. 2 • Salivary glands fixed by freezing and drying and stained, using the periodic acid-Schiff method. Magnification X140. A: Sublingual gland (a) and submaxillary gland (b) of normal nine day old mouse. Sublingual gland contains more densely packed aggregates of cytoplasmic granules. B: Sublingual (a) and submaxillary (b) gland of nine day old animal, seven days after irradiation. Stainability of submaxillary gland is greatly decreased and fewer granules are visible. (Courtesy of Anatomical Record)

produced by organic compounds. Radiation-induced tissue changes may be mediated in several ways: (1) by a direct breakdown of the molecular structure of the cell, (2) by the effects of breakdown of the intercellular substances on the cells themselves, (3) by a direct effect on the molecules constituting the genetic mechanism.

Specific problems of dental interest which have been and are being elucidated involve studies of the pathogenesis of irradiation effects on tooth structure, on the temporomandibular joint and salivary glands, and on oral mucosa. Of particular interest is the utilization of the newer histochemical technics in the study of irradiated tissues. Further exploitation of the various experimental methods discussed may well aid in the discovery of substances which will protect all or part of an animal against radiation injury. The protective effect of several compounds already seems to have been demonstrated,[10, 25, 26] and therapeutic application may follow.

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Penetration of radiocalcium at margins of acrylic restorations made by compression and noncompression technics

R. E. Sausen, D.D.S.; W. D. Armstrong,† M.D., Ph.D., Minneapolis, and W. J. Simon,‡ D.D.S., M.S.D., Iowa City*

Sausen, Armstrong and Simon, of the University of Minnesota, have been able to determine the relative efficiency of pressure and brush technics in the placement of self-cured resin fillings in cavities through the use of radioactive calcium chloride tracer solutions. Fillings were studied with and without water immersion. These investigators have been able to establish that, under their experimental conditions, the brush technic offers some advantages over the pressure technic in the placement of these acrylic fillings in that the marginal seal seems superior when the brush technic is used. The authors point out that further tests are necessary; however, they are to be complimented on their development of this tracer technic with radioisotopes for testing the marginal seal of fillings, and their demonstration of how different clinical technics can be tested in the laboratory. Thereby much information can be made available immediately, and hundreds of fillings will not have to be placed in the mouths of numerous individuals which entails waiting for extended periods of time before final analysis of the results is possible.

The microscope, the air-pressure device, dyes, the interferometer as well as countless clinical observations have been utilized in investigations into the perfection of the marginal seal. Perhaps the most exacting and most convincing device, however, is the radioautograph by which the detection of a single radioactive molecule with a resolution between molecule images of 2 or 3 microns is possible.[1] Since it has been shown that radiocalcium can penetrate enamel defects and lamellas,[2] then this radioactive molecule can play a natural role in testing the marginal seal of any dental filling material.

In a preliminary report,[3] Armstrong and Simon demonstrated that radiocalcium in solution can penetrate at the margin of any filling material; that there appears to be less penetration at the margins of amalgam restorations; also that the seal of the acrylic resins can be somewhat different, depending on how the material is manipulated.

In an effort to make this study more complete, a further series of similar tests has been done with acrylic resin specimens, using both the compression and noncompression (brush-on) technics.

METHODS

Twenty-four sound, extracted, lower cuspid teeth were selected, and Class V box-form cavities, with undercuts in dentin, were prepared in the gingivolabial surfaces of the crowns. All of these cavities were subsequently filled with self-curing acrylic resin. Half of them were immersed in a solution of radiocalcium, labeled Ca^{45}, for 48 hours and the other 12 for 96 hours.

There were three major differences in the procedures utilized with these acrylic restorations: first, in the technic of manipulation; second, in the brand of resin used; and third, in the exposure to water.

Technic of Manipulation • In the compression technic, the polymer was placed in a jar, sufficient monomer was added to moisten all of the powder, and then the jar was closed for 30 seconds. The mixture then was applied to the cavity and was held therein with a continuous band matrix for 30 minutes. Flash was removed at this time. In the noncompression, or brush-on, technic, the cavity was painted with an initial film of monomer, and then beads of moistened powder were repeatedly applied at 30 second intervals until the cavity was overfilled. Excess material was removed 30 minutes later.

Brand of Resin • Replica, Kadon and Fastcrown were the brands of acrylic resin which were used.

Exposure to Water • Half of the teeth were immersed in water for 72 hours immediately after finishing the acrylic margins. The other 12 were allowed to remain relatively dry in a humidifying chamber for 72 hours.

The crowns of all the teeth were immersed eventually in a solution of radiocalcium. After removal from the solution, the teeth were washed and scrubbed under distilled water and invested in transparent methyl methacrylate resin. Longitudinal sections were prepared by cutting lengthwise through the roots and the labial surface of the crowns with a bandsaw, thus making an axial labiolingual section. Since this left a rough surface, the sections were all polished with a fine grit no. 2 emery paper, in a

*Teaching assistant in operative dentistry, School of Dentistry, University of Minnesota.

†Professor of physiological chemistry and head of department, School of Dentistry, University of Minnesota.

‡Formerly professor of operative dentistry and chairman of the division, School of Dentistry, University of Minnesota; now dean of the College of Dentistry, State University of Iowa.

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Enlargement of radioautographs demonstrating decreasing penetration by radiocalcium at margins of acrylic restorations after 48 hours' exposure

straight continuous manner from the apex to the crown.

This polishing procedure was the only special effort made to improve the radioautograph image. Of primary importance was the detection of radiocalcium penetration at the acrylic margins; hence, the relatively large grained dental x-ray film was used because of its greater sensitivity.[1] Exposures were made with the "contact" procedure[1] in cassettes at approximately 15° C. Exposure time varied from 15 to 17 hours. The emulsions were developed in the conventional manner, but safety lamps were never used. Every effort was made to reduce background fog, though it was realized that this is more difficult to do with the thicker emulsions on dental x-ray film.

The radioautographs revealed that radiocalcium can, in time, penetrate at the margin of any acrylic restoration regardless of the material or technic used. Nevertheless, there was consistently less penetration at the margins of the restorations prepared with the brush-on technic. The specimens which showed the least penetration were the ones in which acrylic restorations, made with the brush-on technic which were allowed to remain dry before immersion, were left in the radiocalcium solution for only 48 hours (see illustration).

It is known that "dry" acrylic resin will absorb water, yet no radioactivity was seen within the bulk of the restoration, and in most cases the calcium ions did not adhere to the filling surface. Perhaps the superiority of the "dry" specimens to those which were soaked in water (before immersion in the radiocalcium) is due to the fact that there are dimensional changes when there is early absorption of water and these changes tend to disturb the marginal seal. No appreciable differences were noted between the three brands of acrylic resin.

CONCLUSIONS

1. In time calcium ions will penetrate any acrylic resin margin, regardless of the brand of resin or the technic used for the restoration.

2. Brush-on acrylic restorations have a marginal seal more impermeable to calcium ions than acrylic restorations prepared by the compression technic.

3. There is no penetration of calcium ions into the mass of acrylic material.

Radioautographic study of the deposition of calcium[45] in the cranium, teeth and mandible

J. R. Jarabak, D.D.S., M.S.; Maclyn M. Kamins,† M.D., and Karl L. Vehe,‡ M.D., Chicago*

Jarabak, Kamins and Vehe, of Northwestern University, in a masterful study, show that there are two processes going on in bones and teeth during their formation. They were able to trace the usual processes of ossification and tooth formation through the deposition of radioactive calcium and also to determine the extent of simple ionic exchange which, as they point out, accounts for a significant amount of mineral activity in calcified structures. They also found that the saliva, as well as the blood stream, was a route by which calcium could be brought to the teeth. Their detailed studies were made possible through the use of radioactive calcium which enabled them to make ground sections, and from these, radioautographic exposures on x-ray film, thus giving them a map of the distribution of newly deposited calcium in calcified structures. They were able to conclude that the deposition of calcium is similar to that of alizarin red S, the dye which has been used for studying bone deposition and sites of bone growth.

Some 200 years ago an unknown printer discovered that when he fed pigs weed from which he had been extracting printing pigments their bones would turn red. This chance observation he conveyed to a young surgeon who reported it to his profession.[1] This inaugurated an era of vital staining in the scientific study of bone growth.[2] In the last century another new tool in the study of bone growth, the roentgen ray, was discovered which permitted man to study the physiology as well as the pathology of bone. At the turn of this century, a third important research tool which would soon be applied to bone studies was discovered. This tool was radioactivity. One of the very early workers[3] in this field proved that a substance which is now known as the isotope lead (Pb^{210}) was isotopic with nonradioactive lead, thereby opening the present era, the age of the atomic "tracer."

It was not until 1934, however, that a method of producing such substances artificially was discovered by Irene and Frederic Joliot. This discovery made available radioactive isotopes such as calcium[45], phosphorus[32] and strontium[90] which could be used to label the inorganic

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*Research associate, department of anatomy, Northwestern University Dental School.

†Professor of anatomy, Northwestern University Dental School.

‡Professor of anatomy, Northwestern University Dental School.

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2. Hunter, John. Natural history of human teeth. London, J. Johnson, 1771.

3. Hevesy, G. Radioactive indicators. New York, Interscience Publishers, Inc., 1948.

salts of bone and opened a new field in the physiological studies of bone growth.

A considerable body of knowledge regarding the physiology of bone has been obtained from isotope tracer studies of long bones; however, scientists still are theorizing about the exact mechanism or mechanisms by which calcium and phosphorus enter and leave bone. The research herein described was designed for the purpose of showing, radioautographically, the uptake of the isotope Ca^{45} in the cranium, mandible and teeth of a growing albino rat. Ca^{45} was used, specifically, because it is an emitter of low energy beta particles (0.26 mev), because its image is cast with reasonable sharpness on x-ray emulsion and because it is limited to the bone area where the deposit is greatest.

Research conducted by Bloom and his associates[4] has shown that there are a number of isotopes which have a particular affinity for areas of newly forming bone. Leblond and his co-workers[5] have demonstrated that growth of bone, by accretion, can be followed by the use of the isotope of phosphorus, (P^{32}). On the other hand, Wainwright[6] has shown, radioautographically, that carbon[14], labeled urea, can pass through the enamel of a tooth into the dentin. Bartelstone[7] has demonstrated that radioactive iodine[131] can enter through the enamel into the dentin and pulp of the tooth and from the pulp into the blood stream. Sognnaes[8] has shown that phosphorus[32], likewise, can enter enamel and dentin from the saliva, and he has also pointed out that it can enter the dentin through the blood vessels of the pulp.

METHODS

The animal used for the radioautographs shown herein was one of a growth series of 60 rats. The whole group was divided so that the deposition of the Ca^{45} could be studied for the full period of growth, four rats being used for each age level. Five microcuries of Ca^{45}, a chloride solution ($Ca^{45}Cl_2$) having a specific activity of 0.401 microcurie per gram or .0407 ± 10 per cent millicurie in a 0.10 normal acid solution and being brought to a pH of 6.9 with sodium hydroxide, was injected interperitoneally per 100 Gm. of body weight.

One week after administration of the isotope, the animal was sacrificed and the head was removed from the body; the head was then processed in the autoclave for one half hour under a pressure of 30 pounds. Next the soft tissues were removed, and the skull was placed in a 3 per cent solution of hydrogen peroxide to bleach. The bleached skull was dehydrated in absolute alcohol for 24 hours to prevent the Selectron plastic embedding material from fogging. The two halves of the mandible and the cranium were then placed in a catalyst-free monomer of Selectron for 24 hours. After that time the specimens were removed from the afore-mentioned solution and placed in a Selectron monomer to which catalyst of .05 per cent solution of N-benzoyl peroxide was added. Because of the large size of the block containing the specimens, the initial setting process of the monomer was carried out at room temperature; for final polymerization the block was placed in an oven set at a constant temperature of 50°C. ± 2°C. At this temperature the block was polymerized in 24 hours. It was next cut on a band saw into three blocks, two containing the right and left halves of the mandible and a third containing the cranium. Then the right half of the mandible was cut longitudinally from fore to aft, through the

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8. Sognnaes, R. F., and Shaw, J. H. Salivary and pulpal contributions to radiophosphorus uptake in enamel and dentin. J.A.D.A. 44:489 May 1952.

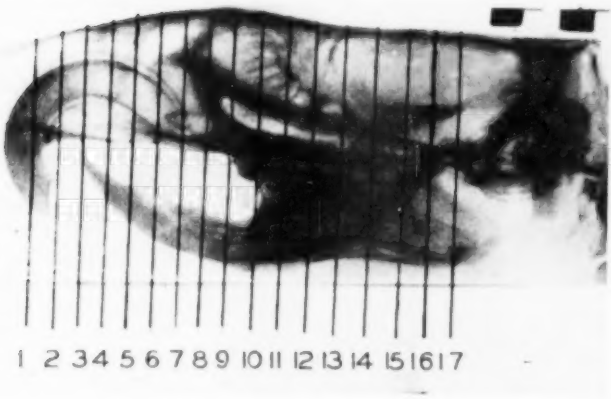

Fig. 1 • Lateral roentgenogram showing areas from which cross sections were taken

middle of the long axis of the molar teeth, and the other half was cut in cross section. Figure 1 shows the areas from which the cross sections were taken.

The cranium was first sectioned through the midsagittal suture into two halves, and then each half was cut longitudinally along the lines shown as areas 2, 3 and 4 in Figure 2. In order to obtain a smooth contacting surface for the x-ray film, the individual sections were finished and polished on number 0/5 emery paper covered with light machine oil. After this polishing they were washed in two changes of xylol to remove the oil and in two changes of 95 per cent alcohol to remove the xylol. Next the specimens were dried in air for four hours, after which time they were taken into the dark room. Each section was then placed on the emulsion surface of a No-screen single emulsion Du Pont dental film and securely clamped with a small plastic screw clamp (these clamps were of sufficient width to maintain the whole specimen in contact with the film). After a trial count of the specific activity of a representative specimen was made in a Geiger-Mueller counter, the specimens were stored in a dark box for a time estimated from the Wainwright nomogram.[9] At the end of the exposure period, the specimens were removed from the films (in the dark room), and the films were developed and fixed in regular film developer and fixer.

The illustrations to be described are positive photographic prints made from the original radioautographs. Therefore, the areas which appear light on the positive photographic print are dark in the originals. These areas represent the sites of radioactive tracers.

The longitudinal section shown in Figure 3 was taken from the portion of the mandible, areas 6 to 15 in Figure 1, and illustrates the crowns and roots of the lower molar teeth as well as the posterior two-thirds of the crown of the lower incisor teeth. Consideration will be given first to the deposition of the Ca^{45} in the mandible (Fig. 3) and then in the teeth.

The alveolar process of the lower incisor teeth shows tracer uptake of approximately half a millimeter on its upper and lower borders, a subperiosteal deposition. In addition to a significantly large uptake of Ca^{45} in the alveolar crest of the upper molar teeth, there is also one in the bony trabeculae of the alveolar processes of the molar teeth where the intertrabecular spaces are large. On the other hand, this uptake is small where

9. Wainwright, W. W. Personal communication.

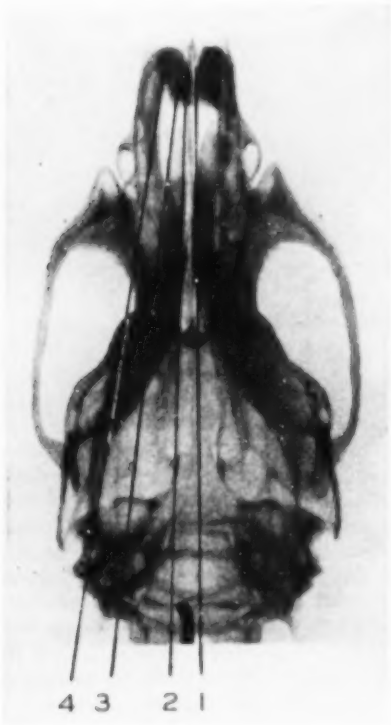

Fig. 2 • Dorsoventral roentgenogram showing areas from which sagittal sections were taken

these spaces are small, thereby suggesting that the avenues of transport are greater in trabecular bone than they are in the dense bone. There are also two distinct areas of tracer element uptake along the alveolus of the lower incisor tooth. This represents the amount of Ca^{45} which was deposited partially along the bone of the alveolus and partially along the cementum of the lower incisor tooth.

The mandibular molar teeth, in longitudinal section, show no tracer uptake in the enamel, a great deposition in the upper coronal dentin, followed by a small uptake in the lower coronal and root dentin. The cementum surrounding the roots of the lower molar teeth is also amenable to Ca^{45} uptake. The very light diffuse shadow in the posterior curvature of the lower incisor tooth lying between areas 11 to 14 (Fig. 1) is the tracer uptake of the pulp, the enamel epithelial organ, and the dentin epithelial organ. From the density of the shadow it is apparent that newly forming dentin and enamel are particularly sensitive to Ca^{45} uptake, and since this section was cut along the lateral wall of the pulp chamber, this shadow was obtained from the lumen of the inner curvature of the pulp cavity. In a cut of this type the enamel epithelial organ is on the lower curvature, and the dentin formative organ is on the upper curvature (both lying between areas 13 to 15).

In addition to the areas of uptake in the teeth and alveolar process (Fig. 3) there is a small irregular elliptical area in the upper right-hand corner which shows a greater peripheral than central tracer uptake. This is the neck of the mandibular condyle.

The first section (Fig. 4,A) in the cross-sectional series taken through the mandible was in area 3 (Fig. 1), and its Ca^{45} uptake is in the form of a small horseshoe-shaped area, the dentin. The dark area, which indicates no tracer uptake, is seen in the lower left-hand corner of this section.

A section (Fig. 4,B) taken more posteriorly (area 6) than the previous one shows a light sickle-shaped area of tracer uptake. This is the lower lingual surface of the alveolar process of the lower incisor tooth. In addition to the alveolar process shown in this section, the inner curvature of this shadow also represents the cementum and dentin tracer uptake. The small ovoid dot in the center of this section is the uptake registered in the apical portion of the pulp. The alveolar uptake in this specimen is restricted to the lower lingual alveolar process which is farther forward than the alveolar process on the upper curvature of the lower incisor tooth.

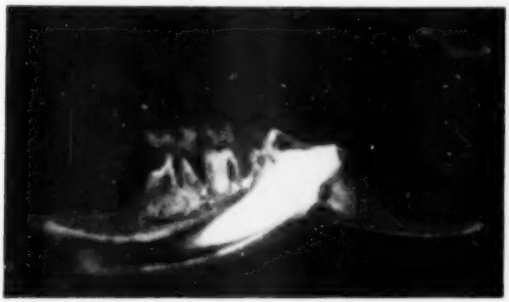

Fig. 3 • Areas of Ca^{45} uptake in longitudinal section of mandible showing deposition in the mandible, lower incisor and molar teeth

The section shown in Figure 4,C was taken from area 8 and shows the incisor completely surrounded by alveolar process with the exception of a very small area on the lingual surface. The outer thin light shadow represents the subperiosteal uptake, the innermost light line is the cementum, and the space between the inner line and the outer line represents alveolar bone of the lower incisor. Hooding the upper portion of the root is a small oval area showing a greater tracer uptake in the trabeculae of the alveolar process. The small light oval-shaped spot in the center of the dark ovoid shadow is the pulp cavity, and the light ovoid area surrounding the central light spot is the dentin of this tooth.

The section shown in Figure 5,A was taken through the distal portion of area 9 and represents the ascending portion of the alveolar process of the lower first molar. The thin, peripheral light shadow, conical in form, is the subperiosteal uptake. Just below the apex of the cone is an elongated ovoid area, running from the superior aspect, inferiorly, which is the cementum of the root of the first molar. There is an area of scattered uptake which goes inferiorly toward the upper surface of the curvature of the lower incisor and is the loose trabecular bone of the first molar alveolar process. The light ovoid area in the center is the pulp cavity, and the ovoid area which surrounds the pulp cavity is the dentin. The small crescent-shaped portion above the superior aspect of the dentin, formed subsequent to the administration of the isotopic tracer, may be the beginning of new dentin; while the small tubercle, jutting out from the labial surface of the alveolar process, is the beginning of the superstructure known as the masseteric line.

The section in Figure 5,B, taken through area 10, is the long axis of the first lower molar and is a cross section of the middle of the lower incisor. In the upper part of this section is a faint light outline of the root of a tooth which after close examination is revealed to be the dentin of the molar root, having an isotopic distribution greater near the occlusal surface and becoming smaller as the pulp is approached. In this section, as in the previous one, Ca^{45} is found in greater amounts in the cementum and in the alveolar process surrounding the

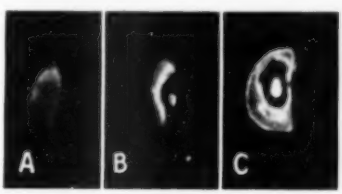

Fig. 4 • Cross sections of lower incisor and the incisor alveolus showing Ca^{45} deposition

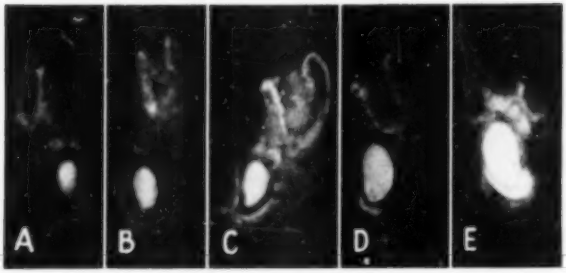

Fig. 5 • Cross sections showing Ca^{45} uptake in mandible from the mesial aspect of the first molar through the distal aspect of the third molar

molar, with a particularly high uptake in the lingual surface of the mandible. Opposite to the lower incisor is the beginning of the superstructure of the mylohyoid ridge.

A section (Fig. 5,C) was taken through the middle of area 12 and is through the interproximal space of the second and third molar teeth. From above down, the tracer activity is found to be along the alveolus of the molar tooth, a region where the alveolar bone is more loosely trabecular than in the previous section. On the buccal surface, the masseteric line is at its greatest development, while on the inferior aspect of the lingual surface, the mylohyoid line is most prominent. The light oval area in the lower portion of the section is the pulp cavity, and the darker area immediately surrounding it is the dentin. There are two light crescent-shaped zones of tracer uptake, one on the upper surface and one on the lower surface of the incisor. The upper, in all probability, represents the formation of new dentin which has taken place during the experimental period; the lower, on the other hand, is the new enamel which was formed during this period.

The section shown in Figure 5,D was cut 0.020 of an inch distal to the previous one, at the level of the mesial root of the third molar (through the middle of area 12); here the root portion of the dentin shows no tracer uptake while the cementum and the surrounding alveolus are rich in Ca^{45}. The lingual and labial crests show areas of accumulation of the tracer element, whereas the pulp cavity at this point is beginning to become larger (light diffuse ovoid shadow). The thin darker elliptical area surrounding the pulp cavity, the dentin, and the light crescent shape on the inferior surface of the dentin, the newly formed enamel, mask the newly formed dentin on the upper surface, while the masseteric line, on the buccal surface, is beginning to descend and to fade into the inferior border of the mandible.

Taken from area 13, the section shown in Figure 5,E is distal on its anterior border to the last molar and encompasses the anterior portion of the posterior curvature of the lower incisor. The thin spinous process projecting superiorly is the beginning of the ascending ramus. Somewhat inferiorly, buccally, and above the upper part of the pulp chamber is a dark vacuolated spot, the canal for the mandibular division of the trigeminal nerve. Medial to this there is a light crownlike area of increased tracer uptake, hooding the pulp cavity. This loose trabecular bone is a portion of the retromolar fossa. Below this, the light shadow of the pulp cavity has become kidney-shaped; while the newly formed enamel on the inferior border is obscurely delineated, the newly apposed dentin is completely masked by the previously apposed dentin. This masking is due primarily to the upper curvature of the

distal portion of the root of the incisor.

The following section (Fig. 6) was taken through the foramen of the inferior dental nerve (mandibular division of the trigeminal nerve) which lies in the anterior part of area 15. The tracer uptake is shown as a light ovoid area, comprising the upper lip of the foramen, on the medial side of the mandible, and a tubercle on its lateral side. The foramen, the darker oval area in the center of the dense light substance, enters this tubercle from the lingual aspect and courses anteriorly along the lateral surface of the lower incisor. The area of greater tracer uptake projects superiorly and represents the coronoid process, while the area of lesser uptake projects inferiorly and is the ramus of the mandible. From this radioautograph it is obvious that in the region of the foramens the superstructures are composed of a less dense trabecular bone and therefore take up more of the tracer element.

The sections shown in Figures 6,B and 6,C were cut through the posterior part of area 16. In the upper part of the section shown in Figure 6,B is found the mandibular condyle, and in the lower part, the angle of the mandible. An area of greater tracer uptake is found along the peripheral edges of the condyle, while, proceeding from the superior aspect inferiorly, the lateral and medial walls show an uptake of lesser magnitude. Greater uptake is again found in the inferior border of the ramus of the mandible. The section shown in Figure 6,C is 0.020 of an inch posterior to the one shown in Figure 6,B, and its uptake of Ca^{45} appears to be greater in the condylar area than that of the previous section. This is accounted for, however, by the fact that in this particular area the condyle is at its maximum width anteroposteriorly. In other words, the zone of deposition in the angle is smaller than in the previous section. From this point posteriorly, the bone thins out to the apex of the gonial angle.

The first section of the sagittal series (Fig. 7) was cut in the midsaggital line (Fig. 2). The best organization of the tracer element, although it is irregularly diffuse in the cranium, is found subperiosteally on the outer and the inner cranial tables, and the areas where this deposition is the greatest are found in the sutures. It is in these sutures that accretion of bone takes place. The sutures at the base of the skull show a greater uptake than those in the upper cranial dome. The upper and oral portions of the palate show a substantial uptake, and along the alveolus of the upper incisor and the oral surface of the palate are the most active areas of uptake in the premaxilla.

The section shown in Figure 8 was cut through area 3 (Fig. 2) to show the uptake of the tracer element in the posterior portion of the root of the upper incisor. In the preparation of this section, the labial half of the anterior curvature of the upper incisor was cut away. Since the area between the upper and lower curvatures of the lingual half of the root is hollow and does not come in contact with the film, only these two curvatures touch it. In spite of this lack of film contact, the upper as well as the lower incisors show very heavy uptake in

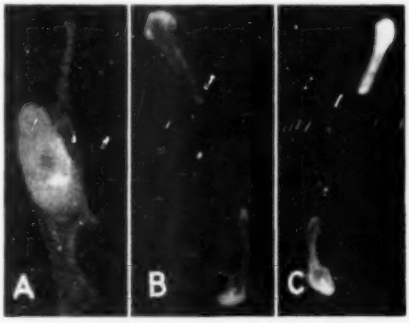

Fig. 6 • Ca^{45} uptake in ascending ramus and mandibular condyle

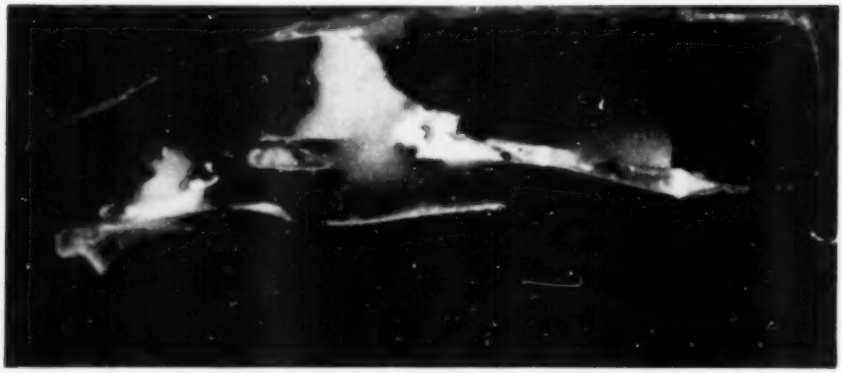

Fig. 7 • Midsagittal section of cranium showing Ca^{45} uptake in cranial sutures, diploë cranial table and maxilla

this part of the tooth, the alveolar processes of the upper molar teeth taking on more of the tracer element than the alveolar processes of the lower teeth. In this section, the dentin of the lingual surfaces of the molar teeth whose uptake is greater nearer the occlusal surfaces also can be seen. The last section is taken from area 4 (Fig. 2) which is through the midocclusal surfaces of the upper molar teeth. The radioautograph (Fig. 9) shows the tracer element to be most abundant in the upper part of the crown dentin, while it shows only a very small amount to be present in the tooth enamel. Thus, although appreciable amounts of Ca^{45} are found in the tooth dentin, the tracer uptake is more extensive in the alveolar area of these teeth.

DISCUSSION

The primary purpose of this study was to determine the sites of Ca^{45} distribution in the cranium, mandible and teeth and its method of entry and fixation. Subperiosteal deposition was found on all inner and outer tables of intramembranous bones and in the sutures between the bones of the skull. Since these are the structures associated with the growth of the cranium, one would expect to find the greatest deposition of the Ca^{45} in these parts. Histologically, the sutures

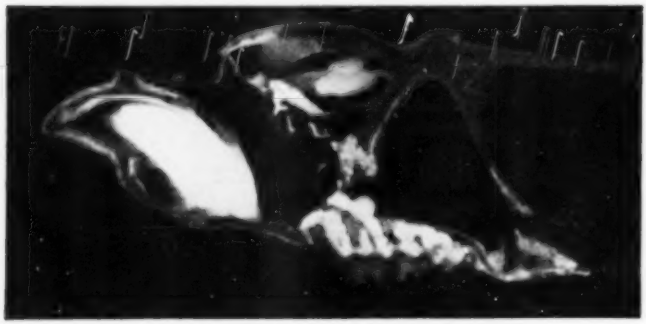

Fig. 8 • Longitudinal section through cranium, upper central incisors and upper molar teeth

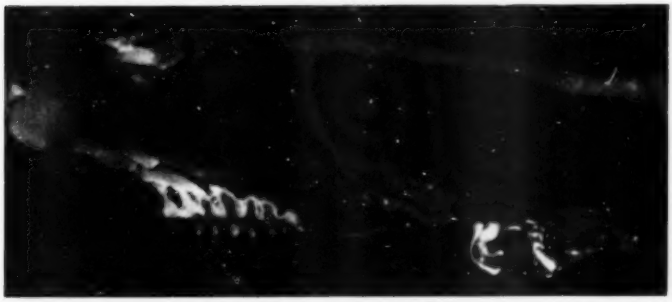

Fig. 9 • Longitudinal section through upper molar teeth

have been shown to be the areas of bone growth of the cranium and of the face. Therefore, the greater deposition of the isotope in these areas indicates that not only is ionic exchange occurring but also accretion is taking place. The lesser degree of subperiosteal deposition suggests that in all probability only ionic exchange is taking place in the periosteum and the endosteum of the outer and inner cranial tables. These observations have been partially substantiated by radioautographic studies in long bones (Leblond[5]). It has been shown further (Manly[10]) by means of radioactive phosphorus (P^{32}) that in the physiological process of bone growth there are two factors: the labile and the stable factor. The labile factor is that amount of phosphorus that is in constant ionic exchange, while the stable factor is that portion which is deposited by accretion and can be recognized by the increase in the size of the bone. Falkenheim[11] and her co-workers have shown that there is an ionic exchange in excess of 50 per cent and that bone, dentin and enamel do not adsorb P^{32} to the same degree. These investigators found that bone would adsorb more than dentin and dentin more than enamel.

Since bone growth in the mandibular condyle by cartilage proliferation is comparable to growth in the epiphyses of endochondral bones, a rather large uptake of radioactive calcium might be expected in this region. Because the density of the shadow in the mandibular condyle is comparable to the density in the sutures in the intramembranous bones of the cranium, it may be concluded that at the growth level at which this animal was used, growth by accretion was taking place in the sutures of the bones of the skull as well as in the mandibular condyle.

The mechanism of the deposition of the Ca^{45} in the teeth is more difficult to evaluate, however, because of the extensive uptake in the walls of the pulp chambers of the upper and lower incisors. It might be assumed from these findings that the mechanism of the deposition of Ca^{45} is strictly an endogenous process associated with the continuous laying down of dentin and enamel in a continuously growing tooth. The apposition of dentin and enamel can, therefore, be readily labeled, identified and studied by the use of the radioactive Ca^{45}. The exchange of Ca^{45} from the blood stream to the root dentin was very small, as indi-

10. Manley, H. C.; Hodge, H. C., and Manly, M. L. The relation of phosphorus turnover of blood to mineral metabolism of calcified tissues as shown by radioactive phosphorus. J. Biol. Chem. 134:293 June 1940.

11. Falkenheim, M.; Neuman, W. F., and Hodge, H. C. Phosphate exchange as mechanism for adsorption of radioactive isotope by calcified tissues. J. Biol. Chem. 169:713 Aug. 1947.

cated by the very faint uptake shadow in the roots of the molar teeth. The cementum, on the other hand, registered a rather substantial uptake which demonstrates that Ca^{45} was being deposited in substantial amounts in this portion of the tooth.

Increase in the density of the Ca^{45} uptake shadow in the coronal dentin suggests that the radioactive tracer also enters the tooth exogenously, that is, by way of the saliva. Although the penetration is not deep, it must nevertheless be recognized as taking place. Sognnaes[8] has shown radioactive phosphorus (P^{32}) enters the teeth by way of the blood stream as well as from the saliva, showing that the findings of this investigation regarding the mechanism of transport of the isotope of calcium into the tooth are similar to those for P^{32}.

Radioautographically the enamel of the molar teeth recorded the least amount of tracer uptake. From this it may be assumed that the smallest amount of ionic exchange was taking place in this portion of the tooth. Although the radioautographic method of determining tracer uptake is more qualitative than quantitative, it has been shown quantitatively that enamel contains about one half as much of the isotopic tracer of phosphorus (P^{32}) as dentin in the incisor teeth and about one ninth as much in the enamel as in the dentin of the molar teeth.[10, 11]

The deposition of Ca^{45} in the bones of the cranium, intramembranous in origin, as well as in the mandible is essentially the same as in endochondral bone.

SUMMARY

The deposition of Ca^{45}, as seen radioautographically, is essentially the same in the bones of the cranium, intramembranous in origin, and in the mandible as it is in the long bones of the body, endochondral in origin; that is, the Ca^{45} is found in greatest abundance in the sutures between the bones of the cranium and to a lesser degree in the periosteum and endosteum. Mandibular condylar uptake, on the other hand, corresponds to the uptake in the epiphyses of the long bones. The magnitude of tracer uptake is greatest in the newly-formed dentin and enamel of the continuously growing rat incisors, less in the coronal dentin, still less in the root dentin, and practically nil in the enamel of the molar teeth.

Deposition of radioactive iodine in teeth of persons treated for disease of the thyroid gland

W. W. Wainwright, D.D.S., M.S.; Byron G. Butt,† D.D.S.; J. Donald Hauptfuehrer,‡ Chicago, and Harold L. Dute,§ D.D.S., Hines, Ill.*

The early work of Bartelstone showed the interesting possibility of using human teeth from patients treated for thyroid disease with radioactive iodine for experimental purposes. When these patients require extractions, they can be scheduled at varying periods after the administration of the radioactive iodine. The group working at the University of Illinois has extended Bartelstone's observations to periods as short as five hours and as long as 19 days. It is startling to learn that a substance can permeate completely the teeth of human beings within five hours, even though the patient only swallows a glass of water containing the radioactive iodine. The further fact that this iodine is retained for periods as long as two weeks, which is the limit possible for this particular radioisotope, is in itself of startling significance since, under laboratory conditions, the same iodine can be washed out of the teeth readily in changes of distilled water over the same period of time. The work of the group at the University of Illinois indicates vast possibilities for the extension of knowledge regarding the behavior of the tooth in its environment.

Radioactive tracers have made possible entirely new types of laboratory and human studies of the changes which take place in teeth not only at the surface but also within the enamel and deeper in the dentin and pulp. In experiments with freshly extracted human teeth, it has been found that one type of salt shows surface effects only and stays on the enamel surface even where there are grossly damaged portions underneath. A second group of compounds behaves in the classical manner as observed with silver nitrate and dyes; that is, these compounds do not penetrate intact enamel but readily penetrate enamel lamellas and damaged portions of the enamel and underlying dentin. Still a third type of penetration is exhibited by small organic molecules which rapidly and diffusely penetrate intact enamel, dentin and cementum, as well as enamel lamellas and damaged portions of the tooth.[1,2] Bartelstone[3] has

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*Department of radiology, University of Illinois College of Dentistry. Now at University of Southern California School of Dentistry, Los Angeles.

†USPHS research fellow of the National Institute of Dental Research, University of Illinois College of Dentistry. Now first lieutenant, USAF, School of Aviation Medicine, Randolph Air Force Base, Texas.

‡Senior medical technologist, department of radiology, University of Illinois College of Dentistry.

§Veterans Administration Hospital, Hines, Ill.

1. Wainwright, W. W. Enamel penetration by radioactive salts of zinc, calcium, silver, plutonium, palladium and copper. J.A.D.A. 43:664 Dec. 1951.

2. Wainwright, W. W. Three levels of enamel permeability. New York J. Den. 21:308 Aug.-Sept. 1951.

3. Bartelstone, H. J. Survey of the use of radioactive isotopes in dentistry. New York J. Den. 20:320 Aug.-Sept. 1950.

Table 1 • List of patients

Patient	Age of patient (years)	Diagnosis of thyroid disease
1	43	Papillary cystadenocarcinoma
2	57	Anaplastic carcinoma with metastases
3	27	Papillary cystadenocarcinoma of left lobe with metastases
4	63	Fetal adenoma of right lobe
5	32	Adenocarcinoma

demonstrated many of these same changes in living human teeth and has pointed out the ease with which *in vivo* studies may be accomplished.

Further studies on the teeth of patients treated with radioactive iodine were made possible through the cooperation of A. Gordon Anderson and the staff of the dental clinic, isotope unit, and tumor clinic of the Veterans Administration Hospital, Hines, Ill. Twenty-five teeth were obtained from August 2 through October 18, 1951. The teeth were obtained from five men who had been treated for disease of the thyroid gland by the oral administration of I^{131}. The patients ranged in age from 27 to 63 years. The individual ages and diagnoses are given in Table 1. The dosages of I^{131}, the reason for loss of the teeth, and the identity of the teeth are given in Table 2. The elapsed time from the administration of the I^{131} until the extraction of the tooth is recorded as the absorption time. This varied from five hours to 19 days and the teeth fall into three groups according to the absorption time: the first from 5 to 6 hours, the second from 16 to 18 hours, the third from 15 to 19 days. The amounts of I^{131} administered were in most cases 25 millicuries although in two instances the dose was 50 millicuries.

UPTAKE OF IODINE

The uptake of iodine in the five-hour specimens is illustrated in Figure 1. Figure 1, A shows a longitudinal section of a lower left second bicuspid. The radioautograph at the left shows a considerable uptake throughout the tooth, especially at the cervical margin and in certain portions of the cementum. The photograph of the ground section on the right of Figure 1, A shows a carious class V cavity on the buccal aspect and slight surface caries on the lingual aspect. These areas correspond to the heavy exposures on the radioautograph. There is a heavy uptake of iodine in the contents of the occlusal fissure. Along the lines of recession of the pulpal horns there is a reduced uptake of iodine, and in the specimens these regions appear to be translucent. In Figure 1, B a series of transverse sections have been made through a lower left first bicuspid of the same patient. The first three sections are in the crown and the last three through the root at approximately even intervals throughout the tooth. A general uptake of iodine through all of the dentin is seen, as well as heavy uptake in the carious occlusal fissures and in the carious cavities on the distal and buccal aspects. In both Figures 1, A and B there is a very heavy uptake of iodine in areas far beneath the damaged surfaces.

Examples of the second group, with an absorption time of 17 hours, are shown in Figures 2, A and 2, B, and of 18 hours in Figure 2, C. In general the appearance of the radioautographs in the 17-hour specimens is much the same as that in the five-hour specimens. Direct comparison of the radioautographs of the 17-hour and five-hour specimens is possible since the exposure times are recorded as equivalent exposure times;[4]

4. Wainwright, W. W. The permeability of human dental root structures to radioactive iodine. J. Periodont. 23:95 April 1952.

Table 2 • *In vivo* penetration of human teeth by radioactive iodine

Absorption time	Patient number	I^{131} Dosage		Reason for loss	Tooth
		Date	Millicuries		
5 hours	1	10-18-51	25	Periodontitis	Lower left second bicuspid (Fig. 1, A)
					Lower left first bicuspid (Fig. 1, B)
	5	9-13-51	25	Preparation for denture	Upper left second bicuspid
6 hours	2	10-18-51	25	Severe abrasion	Lower right cuspid
				Preparation for denture	
16 hours	2	8-2-51	25	Severe abrasion	Lower left lateral incisor
				Preparation for denture	Lower left central incisor
17 hours	1	8-30-51	25	Periodontitis	Upper left lateral incisor (Fig. 2, A)
					Upper left central incisor (Fig. 2, B)
				Preparation for denture	Upper right central incisor
					Upper right lateral incisor
					Upper right cuspid
18 hours	2	8-16-51	50	Severe abrasion	Lower right lateral incisor
				Preparation for denture	Upper right third molar
	3	8-16-51	25	Malposed	Lower right third molar
				Caries	Upper left second molar
	4	8-30-51	50	Periodontitis	Lower right second molar (Fig. 2, C)
					Lower left central incisor
15 days	1	10-18-51	25	Periodontitis	Lower right central incisor (Fig. 3, A)
					Lower right lateral incisor (Fig. 3, B)
					Lower right cuspid
					Lower right first bicuspid
					Lower right second bicuspid
19 days	1	10-18-51	25	Periodontitis	Lower left cuspid
					Lower left lateral incisor (Fig. 3, D)
					Lower left central incisor (Fig. 3, C)

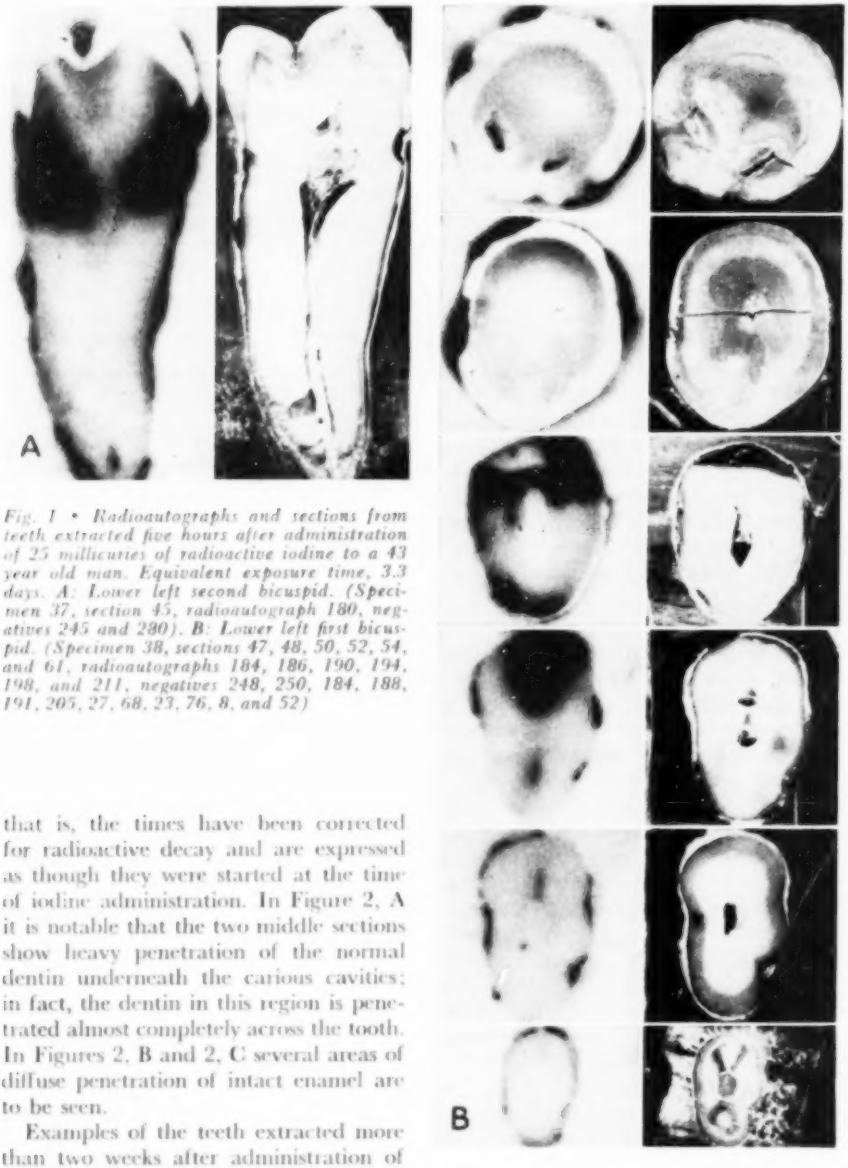

Fig. 1 • Radioautographs and sections from teeth extracted five hours after administration of 25 millicuries of radioactive iodine to a 43 year old man. Equivalent exposure time, 3.3 days. A: Lower left second bicuspid. (Specimen 37, section 45, radioautograph 180, negatives 245 and 280). B: Lower left first bicuspid. (Specimen 38, sections 47, 48, 50, 52, 54, and 61, radioautographs 184, 186, 190, 194, 198, and 211, negatives 248, 250, 184, 188, 191, 205, 27, 68, 23, 76, 8, and 52)

that is, the times have been corrected for radioactive decay and are expressed as though they were started at the time of iodine administration. In Figure 2, A it is notable that the two middle sections show heavy penetration of the normal dentin underneath the carious cavities; in fact, the dentin in this region is penetrated almost completely across the tooth. In Figures 2, B and 2, C several areas of diffuse penetration of intact enamel are to be seen.

Examples of the teeth extracted more than two weeks after administration of I^{131} are shown in Figure 3. Figures 3, A and 3, B show radioautographs and sections of lower right central and lateral incisors of the same patient whose teeth are illustrated in Figures 1 and 2, A and 2, B. Surprisingly the radioautographs show heavy uptake of iodine in several

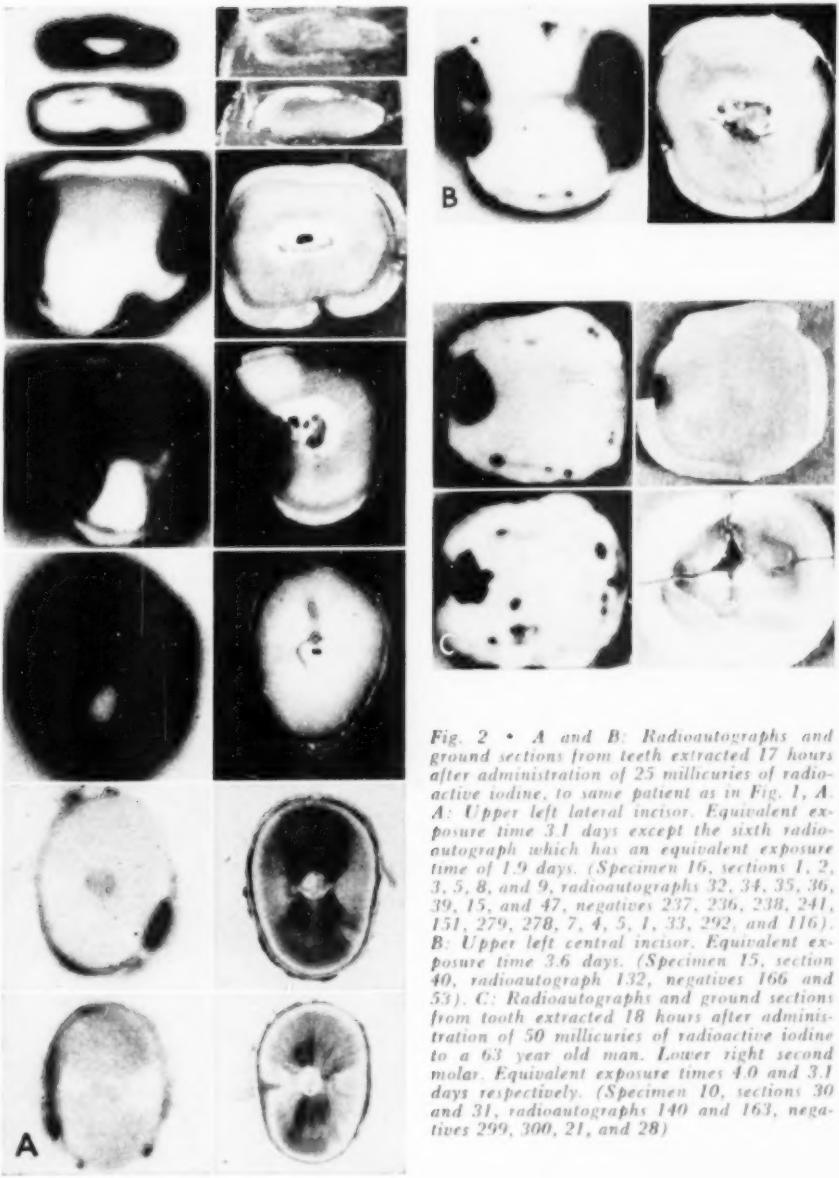

Fig. 2 • A and B: Radioautographs and ground sections from teeth extracted 17 hours after administration of 25 millicuries of radioactive iodine, to same patient as in Fig. 1, A. A: Upper left lateral incisor. Equivalent exposure time 3.1 days except the sixth radioautograph which has an equivalent exposure time of 1.9 days. (Specimen 16, sections 1, 2, 3, 5, 8, and 9, radioautographs 32, 34, 35, 36, 39, 15, and 47, negatives 237, 236, 238, 241, 151, 279, 278, 7, 4, 5, 1, 33, 292, and 116). B: Upper left central incisor. Equivalent exposure time 3.6 days. (Specimen 15, section 40, radioautograph 132, negatives 166 and 53). C: Radioautographs and ground sections from tooth extracted 18 hours after administration of 50 millicuries of radioactive iodine to a 63 year old man. Lower right second molar. Equivalent exposure times 4.0 and 3.1 days respectively. (Specimen 10, sections 30 and 31, radioautographs 140 and 163, negatives 299, 300, 21, and 28)

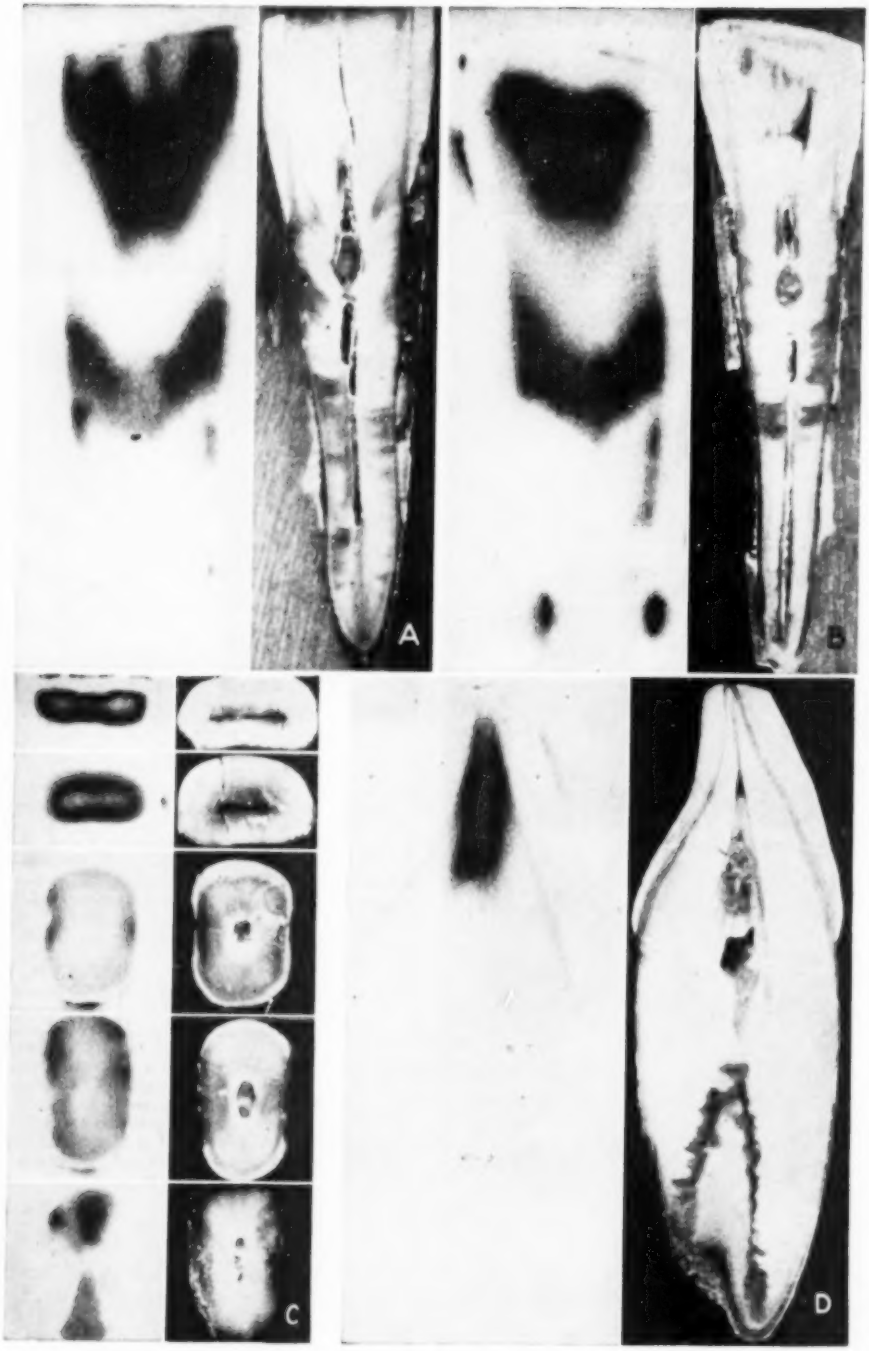
A
B
C
D

Fig. 3 • Radioautographs and ground sections from teeth. A and B extracted 15 days after, and C and D extracted 19 days after administration of 25 millicuries of radioactive iodine to same patient as in Fig. 1, A. A: Lower right central incisor. Equivalent exposure time 2.6 days. (Specimen 41, section 82, radioautograph 251, negatives 228 and 108). B: Lower right lateral incisor. Equivalent exposure time 2.6 days. (Specimen 42, section 88, radioautograph 263, negatives 258 and 111). C: Lower left lateral incisor. Equivalent exposure time 3.6 days. (Specimen 46, sections 119, 120, 123, 124, and 126, radioautographs 325, 327, 337, 340, and 341, negatives 207, 210, 257, 220, 221, 56, 61, 65, 62, and 66). D: Lower left central incisor. Equivalent exposure time 2.3 days. (Specimen 47, section 135, radioautograph 362, negatives 223 and 80)

significant regions of these teeth, especially in the dentin of the crown and in the cervical region. Again, there is complete penetration of the tooth at the neck. The fact that little exposure is seen over the root may be explained partially by the shorter equivalent exposure time, which is in this case 2.6 days instead of 3.3 days. Further information is given in Figure 3, C which is a lower left central incisor extracted from the same patient (No. 1) 19 days after I^{131} administration. The equivalent exposure time on this tooth is 3.6 days. With this slightly longer exposure, iodine uptake is seen to occur throughout this tooth as in the case of the 17-hour and five-hour specimens. Figure 3, D shows a radioautograph of the lower left central incisor from the same patient (No. 1); however, the equivalent exposure time is 2.3 days. Heavy uptake is seen here only in the exposed coronal dentin. It is possible that the absence of radioautographic exposure in the rest of the dentin of the tooth is only due to the shorter equivalent exposure time.

SUMMARY AND CONCLUSIONS

1. The *in vitro* observation of enamel surface uptake, penetration of enamel lamellas and damaged dental structures, and the diffuse penetration of intact enamel (by certain small organic molecules) have all been duplicated in the living human subject in tracer studies with radioactive iodine.

2. No difference in amount of iodine localized in the teeth could be detected by radioautographic technics between teeth extracted at periods after radioactive iodine administration varying from 5 hours to 19 days.

3. For unexplained reasons much of the experimental evidence obtained suggests that the iodine is retained in approximately the original amounts in human teeth under living and *in vitro* conditions for at least two weeks.

Survey of dental uses of radioactive materials—1952

The Council on Dental Research reports on two fields of primary dental interest in atomic energy. A useful listing of references on the civil defense aspects of atomic energy is presented. Among these is one which lists and indexes the principal articles in the field. The survey of dental uses of radioactive materials shows that over 21 radioactive compounds have been utilized in investigations of dental problems. These are listed by institutions and investigators. A total of 70 articles are listed which deal with the use of radioactive isotopes in the study of dental problems.

The dentist and more especially the officers of dental societies desire information of two types on atomic energy. The first need, and it is hoped that the need is a temporary one, is for information relating to civil defense against an atomic blast. Fundamental information on this subject is available, and the sources of such information will be listed later in this article.

The other type of information desired is in regard to the use of radioactive compounds to solve dental problems and to produce new dental information. The reason the dentist and dental society officer need this information at their fingertips is because, if dentistry is to utilize this new tool, considerable financial support and interest on the part of executives and administrators are needed so that the necessary funds will be forthcoming. The interest of dental scientists must be aroused also. The need for specialized training and the need for funds combine to deter the dental scientist and the dental administrator from starting needed projects. Steps can be taken to obtain the vital information which this new tool can provide. Facilities are available to qualified investigators.

In dental investigation it must be emphasized that radioactive materials will not solve every problem. Radioactive materials primarily provide a method of detection. They are not at the present time used for therapeutic purposes in the dental field. The beginning worker and the inquiring dentist need to read certain standard references for preliminary orientation. Much of this material is given in the two Atomic Energy Issues of the *New York Journal of Dentistry* (August-September issues for 1950 and 1951). After obtaining a general introduction to the subject, the dental scientist needs sources of specific information on his problem. The dental society officer also needs to know where he can go for advice when he is consulted regarding proposals for the establishment of research projects and when he wishes to stimulate investigators in the production of new information.

The Council on Dental Research has received replies from 44 dental institutions in the United States and Canada. The information obtained is presented in the table. Projects have been completed or are in progress in 17 institutions.

Presented by W. W. Wainwright on behalf of the Subcommittee on Atomic Energy of the Council on Dental Research before the Section on Research, ninety-third annual session, American Dental Association, St. Louis, September 9, 1952. Subcommittee on Atomic Energy: J.L.T. Appleton, chairman, T. Kaletsky, and W. W. Wainwright.

Table • Dental investigators using radioisotopes

Radioisotope	Individual and institution*
Beryllium^{7}	Leicester, H. M., and Thomassen, P., *P&S*
Cadmium^{115}	Leicester, H. M., and Thomassen, P., *P&S*
Calcium^{45} chloride	1. Armstrong, W. D., Singer, L., and Simon, W., *M* 2. Becks, H.; Myers, H. M., and Jennings, E., *C* 3. Bevelander, G., and Amler, M. H., *NYU* 4. Geschicter, C. F.; Roller, A.; Golin, A., and Rubin, M., *G* 5. Jarabak, J. R., *NW* 6. Wainwright, W. W.; Butt, B. G., and Hauptfuehrer, J. D.,
Carbon^{14}	
Carbonate	1. Armstrong, W. D., *M*
Glucose	2. Wainwright, W. W.; Butt, B. G., and Hauptfuehrer, J. D.,
Sucrose	3. Wainwright, W. W.; Butt, B. G., and Hauptfuehrer, J. D., *I*
Urea	4. Wainwright, W. W., and Lemoine, F. A., *LASL*
Columbium^{95}	Becks, H.; Myers, H. M., and Jennings, E., *C*
Carrier free	
Fluorine^{18}	1. Becks, H.; Myers, H. M., and Jennings, E. *C* 2. Likins, R. C., *USPHS-D* 3. Volker, J. F., *A*
Gallium^{72} nitrate	English, J. A., and Dudley, H. C., *USN*
Iodine^{131}	1. Burstone, M. S., *I* 2. Fosdick, L. S., *NW* 3. Wainwright, W. W.; Butt, B. G., and Hauptfuehrer, J. D.,
Carrier free Human serum Albumin	Bartelstone, H. J., *USPHS-SI*
Iodoacetic acid	Leicester, H. M., and Thomassen, P., *P&S*
Sodium^{23}	Armstrong, W. D., *M*
Sodium^{24}	
Dental porcelain	Wainwright, W. W., and Tylman, S. D., *I*
Phosphorus^{32}	1. Becks, H.; Myers, H. M., and Jennings, E., *C* 2. Bevelander, G., and Amler, M. H., *NYU* 3. Blayney, J. R., and Wasserman, F., *Z* 4. Burstone, M. S., *WU*, and Engel, M. B., *I* 5. Geschicter, C. F.; Roller, A.; Golin, A., and Rubin, M., *G* 6. Glickman, I., *T* 7. Jarabak, J. R., *NW* 8. McCann, H. G., and Zipkin, I., *USPHS-D* 9. Sognnaes, R. F., and Shaw, J. H., *H* 10. Volker, J. F.; Lazansky, J. P., and Finn, S. P., *A*
Chromium phosphate	Burstone, M. S., *I*
Phosphoric acid	Zander, H. A., and Glass, R. L., *T*
Sulfur^{35}	
Penicillin	Wainwright, W. W.; Wach, E. C., and Knudtzon, K. F., *I*
Thiourea	Wainwright, W. W.; Butt, B. G., and Hauptfuehrer, J. D.,
Strontium^{89}	
Lactate	Becks, H.; Myers, H. M., and Jennings, E., *C*
Nitrate	Savchuck, W. B., *USPHS-SI*
Yttrium^{91}	Burstone, M. S., *I*
Zirconium^{95}	
Carrier free	Becks, H.; Myers, H. M., and Jennings, E., *C*
Unspecified	Burnett, G. W., and Sumnicht, R. W., *USA*

*Universities and institutions: A, Alabama; C, California; G, Georgetown; H, Harvard; I, Illinois; LASL, Los Alamos Scientific Laboratory; M, Minnesota; NYU, New York University; NW, Northwestern; P&S, College of Physicians and Surgeons, San Francisco; T, Tufts; USA, U.S. Army Medical Service Graduate School; USPHS-D, USPHS National Institute of Dental Health; USPHS-SI, USPHS Hospital, Staten Island, N. Y.; USN, U.S. Naval Medical Research Institute; VA, Veterans Administration; WU, Washington University, St. Louis; Z, Zoller Memorial Dental Clinic, University of Chicago.

Forty-four dental scientists have participated. The table shows the isotopes and compounds under investigation, the names of the investigators, and the institutions. When advice is needed on a specific project, the dental scientist or the dental society officer may obtain helpful information from the individuals listed in the table. The final section of this report is a list of articles which describe the use of radioisotopes in dental investigations. The Council will appreciate notification of additional projects, workers, and references.

PUBLICATIONS THAT RELATE TO CIVIL DEFENSE AGAINST ATOMIC BLAST

1. The effects of atomic weapons. The Los Alamos Scientific Laboratory, United States Department of Defense and the United States Atomic Energy Commission, Washington, D. C., Government Printing Office 1950, 450 p., $1.25.

2. A general account of the development of methods of using atomic energy for military purposes under the auspices of the United States Government, 1940-1945. H. D. Smyth, Washington, D. C., U. S. Government Printing Office, 1945, 182 p., $0.40—also published under the title: Atomic energy for military purposes, Princeton, N. J., Princeton University Press, 1945, 308 p., $2.

3. Civil defense against atomic attack: preliminary data, Joint Committee on Atomic Energy, U. S. Congress. Washington, D. C., Government Printing Office, 1950, 70 pages.

4. Civil defense supplement to the American Red Cross first aid textbook. Philadelphia, Blakiston Co., 1951, 47 p., illustrated, $0.10.

5. Health services and special weapons defense. Federal Civil Defense Administration, Publication, AG-11-1. Washington, D. C., U. S. Government Printing Office, 1950, 260 p., $0.60. (This book outlines the functions of the medical, dental, and related professions during atomic attack.)

6. Atomic bombing; how to protect yourself. Science Service; Watson Davis, and others. New York, William H. Wise & Co., 1950, $1.95.

7. Atomic warfare; civil defense manual of basic training. Pamplet No. 6. Prepared by the Home Office (Great Britain). London, H. M. Stationery Office, 1950, 61 p. (Obtainable from British Information Office, 30 Rockefeller Plaza, New York City.)

8. Medical aspects of atomic weapons. Prepared for the National Security Resources Board by the Department of Defense and the U. S. Atomic Energy Commission. Washington, D. C., U. S. Government Printing Office, 1950, 24 p., $0.10.

9. The status of civil defense in American cities, November 1950. Edited by D. W. Hanks and R. H. Blundred. Chicago, American Municipal Association, 1950, 159 p., $3.

10. Selected readings on atomic energy. U. S. Atomic Energy Commission, Washington, D. C., U. S. Government Printing Office, $0.15.

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64. Wainwright, W. W. Time studies of the penetration of extracted human teeth by radioactive nicotinamide, urea, thiourea and acetamide. Diffuse penetration from the enamel surface. In press.

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Trichloroethylene in dentistry: general analgesia

Max S. Sadove, M.D.; Gordon M. Wyant,* M.D., and John M. Spence,† D.D.S., Chicago*

The relief and control of pain is a problem of major concern in the practice of dentistry. It is recognized that there is no single agent or technic that solves all the complex problems of pain. Clinical experience in recent months has indicated that the drug trichloroethylene has some advantages which justify careful evaluation of its use. The drug has proved useful both as an analgesic and as a general anesthetic; because of its analgesic properties it may prove especially useful in the dental profession.

General analgesia may be defined as a state of diminished sensitivity to pain without loss of consciousness. It is characterized by an elevated threshold of pain with or without an altered response to pain.

Trichloroethylene has been known since 1864; however, it was not until 1928 that trichloroethylene was proposed and used in the treatment of trigeminal neuralgia.[1,2] Jackson with a suggestion made in 1934 was the first to propose that trichloroethylene should be used as an anesthetic and analgesic agent;[3] in the following year he reported favorably on 300 cases in which it was used.[4] In 1941 Hewer published his first series of 127 cases in Britain;[5] the following year he reported on 400 administrations.[6] Since then this agent has been used in over a million cases in Great Britain alone.[7]

In 1943 Waters, Orth and Gillespie[8] reported on the use in this country of trichloroethylene as the principal agent for moderately deep general anesthesia. Their report, which stressed the occurrence of undesirable effects on the cardiac mechanism, was largely instrumental in delaying acceptance of this agent in the United States. The long, successful experience of British and later of Canadian anesthesiologists maintained interest in trichloroethylene and resulted in a re-evaluation of this agent in the United States. In recent months this agent has been used at the University of Illinois as the principal analgesic for dentistry in approximately 250 cases.

*Department of surgery (anesthesiology), University of Illinois College of Medicine.

†Department of operative dentistry, University of Illinois College of Dentistry.

Supplies of trichloroethylene, Cyprane inhalers, the dental analgesia assembly and the illustrations were provided by the Ohio Chemical and Surgical Equipment Co.

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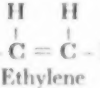
PHYSICAL PROPERTIES

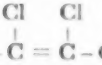
A highly purified product of trichloroethylene is commercially available for anesthesia and analgesia. To this colorless liquid a blue dye has been added for the purpose of identification. The dye is one certified by the Food and Drug Administration as having no harmful effects on the body. Under favorable conditions the drug and its dye are exceptionally stable; tests to date have shown no deterioration over periods of time far in excess of the usual time for clinical storage. As an additional precaution to prevent its deterioration, 0.61 per cent thymol has been added to the drug. For even greater safety, it is suggested that residues left in the vaporizer for two days be discarded. In low concentrations trichloroethylene has a rather sweet, aromatic odor, which has not been declared unpleasant by any of the patients for whom it has been used at the University of Illinois.

The drug is similar to chloroform in many ways. The following formulas show the similarity of its formula to those of chloroform and ethylene:

Trichloromethane
(chloroform)



Ethylene



Trichloroethylene

Trichloroethylene has a speed of action not unlike that of chloroform and a relative safety rather close to that of ethylene. It has a boiling point of 86.9° C. at 760 mm. Hg. pressure, so that it is a relatively nonvolatile compound at room temperature. Its use with an open mask or with unsuitable volatilizing equipment is difficult and possibly hazardous. The liquid has a specific gravity of 1.47, and its vapor is approximately four and a half times as heavy as air. One of the great advantages of trichloroethylene is the fact that under clinical conditions it is nonexplosive and nonflammable when mixed with room air at any temperature. This property is of tremendous importance to almost all practicing dentists because the conditions in the average dental office are conducive to explosions. When mixed with oxygen, trichloroethylene has a narrow range of flammability, which, however, is well beyond the anesthetic range. Mixtures of approximately 10 per cent trichloroethylene and 90 per cent oxygen[9] are explosive. Danger from such a mixture may be disregarded for all practical purposes, as the maximum clinical concentration for anesthesia is about 2.5 per cent. In the presence of an open flame, as for diathermy, however, traces of phosgene may form as a result of the decomposition of trichloroethylene. Smoking when trichloroethylene is present should be discouraged because the inhalation of small traces of phosgene derived from the trichloroethylene and drawn through the flame of a cigarette may prove harmful over a period of time. When an open flame is used in the dental office with trichloroethylene present, it should be kept well elevated from the floor and at a range of more than 6 feet. If possible, a fan should be used to aid in the circulation of air in the room and to diminish the concentration.

Trichloroethylene tends to decompose if it is not protected by a stabilizing agent such as thymol and if it is exposed to alkali, direct sunlight or ultraviolet light; however, protected by the addition of thymol, put in colored bottles and kept

9. Thomas, G. J. Do you know? Fires and Explosions. Newsletter, Am. Soc. Anesthesiologists 16:20 Dec. 1952.

away from sunlight, the drug may be stored at room temperature for a period of at least six months.

Trichloroethylene mixes freely with agents such as oxygen, nitrous oxide, ether and the common anesthetic gases now in use. When used in the presence of soda lime, however, toxic break-down products such as dichloracetylene and phosgene form; these products are potentially harmful. Therefore, trichloroethylene should never be used in a closed system with soda lime.[10]

PHARMACOLOGICAL PROPERTIES

As trichloroethylene chemically somewhat resembles both chloroform and ethylene, it exhibits many of the properties of both these agents. Most of the pharmacological data on trichloroethylene apply to its use as a general anesthetic rather than as an analgesic agent. Broadly speaking, in clinical doses it has the potency of chloroform and the lack of viscerotoxic effects of ethylene. As in the use of chloroform, the simultaneous administration of epinephrine or of similar drugs of a dihydroxyphenylamine structure is not permissible because of the likelihood that cardiac arrhythmias may develop; there is also the possibility of ventricular fibrillation. Other vasoconstrictors and vasopressors which must not be used in conjunction with trichloroethylene include levoarterenol (Levophed) and nordefrin (Cobefrin). There are other drugs which may be used for vasopressor and vasoconstrictor effects; one of those best known to the dentist is phenylephrine (Neo-Synephrine). Although in actual practice epinephrine has been used with trichloroethylene and fatalities have not been recorded,[11] nevertheless, this practice introduces a hazard and therefore cannot be justified at this time.

All true anesthetic agents before causing the third stage, the stage of surgical anesthesia, bring about a first stage of general analgesia and then a second stage of delirium or excitement. The second stage is somewhat under the control of the anesthesiologist and may be modified or avoided completely by adequate preparation of the patient and by sedation. This excitement or delirium stage, which is of short duration, is rarely observed when trichloroethylene is used. It is for this reason that the agent became popular in the early days when it was used as a supplement to nitrous oxide for the induction of surgical anesthesia.

The stage of general analgesia varies according to the properties of the anesthetic agent. With some drugs the stage of analgesia is short and ill-defined, while with others it can be produced and maintained with relative ease. Agents of the latter type are clinically valuable. Trichloroethylene, which is one of these, possesses great analgesic properties.

With trichloroethylene it is possible to maintain a state of general analgesia for a considerable period of time. With the establishment of analgesia, the patient experiences a feeling of warmth, well-being and exhilaration. There is frequently a slight flushing of the face, slight perspiration and a feeling of numbness and tingling that is usually not too unpleasant. There may also be a sensation of lightness or slight vertigo. Amnesia also occurs of such a nature that the patient remembers almost nothing of the operative procedure and usually loses awareness of time. The patient who initially clutches the chair and is rigid and tense becomes mentally calm, physically relaxed and relatively comfortable.

Trichloroethylene, like all analgesic, sedative, narcotic or hypnotic drugs, should not be used for self-medication. The dangers of self-medication are too obvious to require discussion, but too few individuals facing problems of chronic

10. Firth, J. B., and Stuckey, R. E. Decomposition of trilene in closed circuit anaesthesia. Lancet 1:814 June 30, 1945.

11. Ostlere, Gordon. Trichlorethylene anaesthesia. Edinburgh, E. & S. Livingstone, Ltd., 1953.

pain realize the danger of these drugs. Self-administration and indiscriminate prescription of these drugs multiply the dangers of habituation if not of addiction. The hazards of erroneous diagnosis also are increased. Therefore, the use of these agents should always be under the careful control of a qualified practitioner.

Since trichloroethylene is a potent agent, it is a matter of comparative ease to attain surgical anesthesia with the drug. Concentrations as low as 0.25 to 1.5 per cent may suffice; however, trichloroethylene should be used only for light general anesthesia, since in the concentration required for deep surgical anesthesia the drug exhibits certain undesirable features.

As stated previously, deep levels of surgical anesthesia produced with trichloroethylene are not desirable, necessary or safe. The deeper the plane of anesthesia produced with trichloroethylene, the more frequently cardiac arrhythmias occur. Usually these arrhythmias take the form of auricular extrasystoles, but ventricular extrasystoles and ventricular multifocal tachycardia do occur in rare instances. Multifocal tachycardia is usually considered a precursor to ventricular fibrillation and is therefore of grave significance. A number of authors have pointed out, however, that when ventricular multifocal rhythm occurs during trichloroethylene anesthesia, it is by no means as certainly a precursor to ventricular fibrillation as it would be if chloroform were being administered.[12, 13] It appears that no cases of cardiac arrest from the use of trichloroethylene have been reported in this country. In 1948 Hewer reported that only two cases of cardiac failure possibly attributable to the use of trichloroethylene had been described and that in those cases the role of the drug in the causation of the disaster had been far from clearly established.[7, 14] In the entire literature only one case of necrosis of the liver in connection with the use of trichloroethylene has been recorded, and the role of trichloroethylene in this complication was at least doubtful.[15]

Trichloroethylene has so often been compared with chloroform that it is necessary to stress that in animal experiments it has proved less toxic than chloroform.[16, 17] It has been stated also that its toxic effects on the liver are not only less than those of chloroform but also less than those of ether.[18] Renal function is not significantly changed by this agent, and the disturbance of the metabolism does not seem to exceed that caused by other agents commonly used for general anesthesia. Changes in blood pressure are neither significant nor consistent,[14] but capillary oozing is reduced.

The occasional occurrence of severe tachycardia or tachypnea is an undesirable result of the use of trichloroethylene often associated with high concentrations of the agent; with the more efficient equipment now available, these conditions occur rarely during anesthesia and rarely if ever during analgesia. They may be relieved by lightening the plane of anesthesia and by improving the respiration of the patient. If either condition persists despite these measures, it is necessary to use some other drug or technic. Bradycardia and arrhythmias are always associated with overdosages, which would occur rarely in dental practice.

Induction of anesthesia with trichloroethylene is both rapid and pleasant. Trichloroethylene has practically no irritat-

12. Kurtz, C. M.; Bennett, J. H., and Shapiro, H. H. Electrocardiographic studies during surgical anesthesia. J.A.M.A. 106:434 Feb. 8, 1936.

13. Barnes, C. G., and Ives, J. Electrocardiographic changes during trilene anaesthesia. Proc. Roy. Soc. Med. 37:528 July 1944.

14. Haworth, J., and Duff, A. A note on trichlorethylene anaesthesia. Brit. M. J. 1:381 March 27, 1943.

15. Duddis, G. H. Necrosis of the liver and bilateral massive suprarenal haemorrhage in the puerperium. Brit. M. J. 1:769 June 2, 1945.

16. Joachimoglu, G. Die Pharmakologie des Trichlorathylens (Chlorylen Kahlbaum). Berl. klin. Wchnschr. 58:147, 1921.

17. Kraetz, J. C., Jr., and others. Contribution to the pharmacology of trichlorethylene. J. Pharmacol. & Exper. Therap. 54:327 July 1935.

18. Armstrong, D. M. The assessment of liver damage following trichlorethylene and diethyl ether anaesthesia. Anaesthesia 2:45 April 1947.

ing effect on the respiratory passages in the concentrations in which it is used clinically provided that the vapor strength is increased gradually. Salivation is not increased; in striking contrast with all the agents previously used for dental anesthesia, trichloroethylene rarely causes nausea and vomiting even when the patients are children and nervous individuals. The incidence of nausea is about 2 per cent and that of vomiting 1 per cent or less; these side effects usually occur only when the swallowing of blood disturbs the gastrointestinal tract.

Trichloroethylene is eliminated from the body unchanged, mainly through the respiratory tract. Recovery from anesthesia is usually rapid although traces of the drug may remain in the blood stream after full recovery has taken place. It must be remembered, however, that trichloroethylene has an affinity for fatty tissues and that after prolonged or unduly deep anesthesia the agent will be eliminated a little more slowly and the return to the normal state will be slightly prolonged.

ANALGESIA APPARATUS

Trichloroethylene analgesia is best administered and controlled by means of instruments especially designed for the purpose. At the University of Illinois clinic, the Cyprane inhaler adapted for nasal administration has been found most satisfactory. A similar apparatus might prove equally satisfactory. The Cyprane inhaler is particularly suited for dental use, especially for the production of analgesia for short periods. In anesthesia for children in particular, it is useful in the extraction of deciduous teeth. The concentrations of trichloroethylene employed with it are not in the anesthetic range for the average adult unless the full-on position is maintained for some length of time.

The upper part of the illustration shows the specially designed dental assembly. The inhaler is mounted on a stand, at the top of which is incorporated a nonreturn flutter valve. This valve is surmounted by a transparent dome which permits the administrator to observe whether the patient is breathing correctly through the nasal mask; if inhalations are taken through the mouth, air is no longer drawn through the apparatus, and the valve ceases to move with respiration. From the valve a wide-bore corrugated rubber hose leads to a small nasal inhalation mask. The large diameter of the tubing minimizes resistance to breathing and thus makes breathing easier. The mask has an expiratory valve and an adjustable head strap.

The lower part of the illustration shows a cross section of the inhaler. As the patient inhales, air is drawn through the holes in the mixture-adjusting collar, F; the air is then directed down into the trichloroethylene chamber through slots in G or upward to the outlet through slots in E, or through both, depending on the setting of the mixture-adjusting collar. Rotation of the mixture-adjusting collar alters the relative areas of the opening of the ports, G and E, and consequently the amount of air passing through the trichloroethylene chamber and the resultant concentration of the drug.

Gases are exhaled through the exhalation valve in the nasal mask, being prevented from reaching the trichloroethylene chamber by the flutter valve on top of the stand. The nonreturn valve, D, in the inhaler and the exhalation valve, B, which fulfill no purpose in the dental assembly, are encased in the valve housing, C. A key, illustrated at the right of the cross section, may be used to hold the mixture-adjusting collar in any desired position.

The inhaler is filled through the port at H; 15 cc. of trichloroethylene is used for each filling if the inhaler has been used recently; but 30 cc. should be used if the inhaler has not been used for several days and is completely empty. This dental

assembly has the advantages of lightness, portability, economy, ease of maintenance and durability. Instead of being used with a stand, it may be adapted and attached to the dental chair or other equipment. Vaporizing bottles or drippers attached to standard anesthesia or analgesia machines are much less satisfactory; when they are used, maintenance of analgesia and avoidance of anesthesia are more difficult since higher concentrations of trichloroethylene are produced by these assemblies and the range of analgesia is less easily controlled.

In the assembly used in this study, analgesia is controlled by the dentist. Self-administration does not add to the efficiency of the technic. On the contrary, the method described here is considered superior to self-administration because timing is of less importance. Once the operator has set the apparatus at the determined concentration, the patient will remain in analgesia as long as he breathes the mixture. Within limits the patient retains a degree of control over the depth of analgesia, for the deeper and the more frequently he breathes, the more trichloroethylene he absorbs. Self-administration may not give satisfactory results because the patient in his preoccupation does not carry out the procedures necessary for delivery of the agent. There is much less that can go wrong in the apparatus described here.

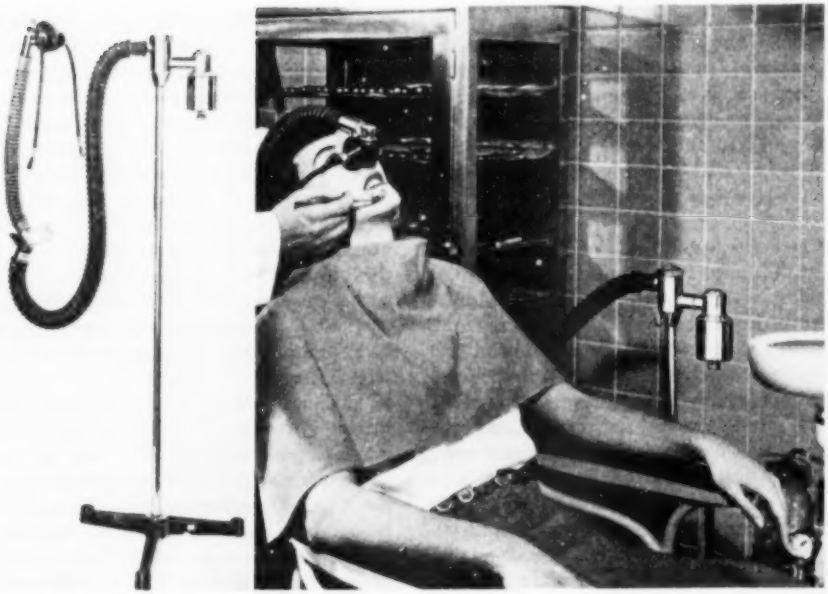
A tank of oxygen with a bag and a mask should be available. This is not a specific requirement for the use of trichloroethylene but a necessity for any adequately equipped dental office, whatever type of analgesia, including local analgesia, is used. There is no need for extra personnel since the qualified dentist can administer the agent himself.

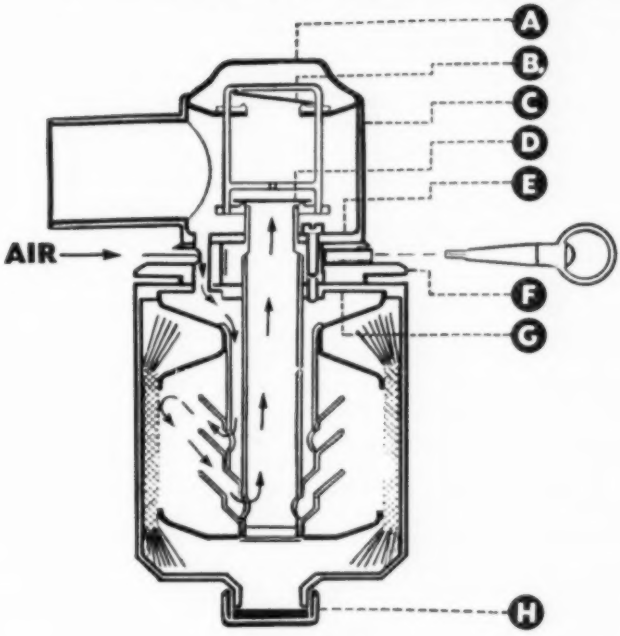
PREPARATION FOR ANALGESIA

Before the administration of analgesia, it is well for the administrator to discuss with the patient the purpose of analgesia and to explain what he is expected to do, how he can contribute to the success of the analgesia, and what sensations he is likely to experience. He should be told that though he will not go to sleep he will feel no pain. It should be emphasized that the vibrations from drilling and the grating from scaling cannot be eliminated but that this is all that he will feel.

He should be told that an inhaler will be placed over his nose, that he must inhale through the nose but that he may exhale through the nose or through the mouth. He must understand that the success of the method depends on his continuous breathing through the nose, as otherwise the analgesic agent will not reach the blood stream and the analgesia will cease. He should be informed also that he will perceive a faint sweetish odor, which will not be unpleasant and which will not make him cough or choke. At this point it may be wise to let him try on the inhaler to give him an idea of the effects of the drug. The concentration of the drug should be extremely light during this test. At this time the patient should be instructed also how to breathe through the nose. He must be told that onset of analgesia usually manifests itself first in the finger tips and the toes as a tingling sensation which may pervade his whole body and which may later be supplanted by a sensation of numbness, warmth and pleasant relaxation. He must be told that it takes a few minutes for analgesia to become established and that its presence is verified by testing before any painful procedures are begun. Lastly, he must be reassured that the technic involves no dangers nor undesirable side effects.

The patient is instructed to take as comfortable a position in the chair as possible. Before applying the nose mask, the administrator makes sure that no undue vapor concentrations have accumulated in the equipment as a result of recent filling or of volatilization while not in use. The mask is then applied over the patient's nose and the head strap ad-





The cyprane inhaler

justed. Both strap and mask should be placed comfortably, to avoid pressure on the face and the head and to prevent interference with free breathing, and yet firmly enough to prevent leaking of the air around the mask.

MAINTENANCE OF ANALGESIA

Once the patient has become accustomed to the nasal inhaler and to the minimal odor of trichloroethylene, the mixture-adjusting dial on the inhaler is very gradually advanced. Time should be permitted for the patient to become accustomed to each concentration before the setting is advanced to the next higher position. About five to ten respirations should be permitted before the dial is advanced even half a notch. Meanwhile, the operator maintains contact with the patient in a quiet, reassuring voice. The patient is frequently reminded to keep breathing through the nose; the operator constantly watches the flutter valve in the stand of the apparatus to make sure that the patient is complying with this important prerequisite.

The final position of the dial for analgesia varies from patient to patient, as does the response to any drug. In many instances the first or second notch on the dial is satisfactory after sufficient time has elapsed for establishment of analgesia. It is a common mistake of beginners to administer too high a concentration of trichloroethylene. With minimum concentrations the patient still retains normal inhibitions and reacts in a rational fashion to a painful stimulus, but this near-normal response changes with the approach to the second stage of anesthesia. The delirium which is characteristic of the second stage may be expressed in a greatly exaggerated response to any stimulation, even if such a stimulus is not accompanied by pain; and the patient's demeanor may be such as to make an operation difficult. It must be remembered also that some minutes must elapse between the change in the setting of the mixture-adjusting dial and the consequent change in the depth of analgesia. If it is found that analgesia is inadequate and a greater concentration is required, work must be discontinued until the greater concentration has had time to exert its effect on the patient. If this precaution is not observed, greater and greater concentrations are administered in short sequences with the result that the patient eventually enters the second or even the third stage of anesthesia when the increased strength of vapor has had time to exert its full effect.

The patient must be discouraged from talking during the administration, as talking interferes with smooth nasal inhalation; however, he may indicate by signs the onset of tingling and numbness. This indication may be useful for the beginner who may have some difficulty in recognizing the onset of analgesia. With more experience in the method, the operator is able to evaluate with more precision the signs of analgesia, such as a slight flushing of the face, slight perspiration and the relaxed position of the patient in the chair. Meanwhile the operator keeps reminding the patient to inhale through the nose and observes closely the glass-domed flutter valve or listens for its clicking.

In the conduct of analgesia and the adjustment of the concentration of the drug, the administrator must beware of confusing reactions to stimuli with those to actual pain. Many patients make little noises or grimaces, which on close observation the operator notices are not the typical reactions to pain; reaction to pain is considerably altered. Frequently when patients are questioned later, they are confused as to the intensity of what they experienced under analgesia. They may often say that a particular stimulus was uncomfortable but rarely that there was any real pain. They may make such statements as: "I didn't feel any pain, but I was afraid it was going to hurt," or, "I

felt some pain, but it didn't hurt."

The depth of analgesia depends on the individual, but most minor procedures can be carried out under trichloroethylene analgesia. The analgesia is far in excess of that obtainable with nitrous oxide. If desired, local anesthetics may be used in addition to trichloroethylene, especially in sites where severe pain stimuli are anticipated. Such solutions, however, must not contain a vasoconstrictor which is contraindicated in the presence of trichloroethylene.

The operator should anticipate the end of the operative procedure and discontinue the analgesia so that the effects of the drug will wear off as close to the end of the operation as possible. Analgesia usually wears off within five minutes, but the time depends somewhat on the duration and the depth of the analgesia; the longer the period of administration, the greater the delay in eliminating the drug. The patient may be kept in the waiting room for another five or ten minutes; most patients are in complete control of themselves after that time.

INDICATIONS AND CONTRAINDICATIONS

Trichloroethylene analgesia has been found extremely valuable for cavity preparations, for incision and drainage of abscesses, for periodontal scaling and for similar procedures. When the patient is relaxed, the dentist is able to work with greater speed and to accomplish more work with each sitting. The patient is able to tolerate work for long periods much better than if no analgesic were used. Trichloroethylene analgesia has been maintained in the clinic at the University of Illinois for periods of almost three hours. When asked about the length of time they have been in the chair, not infrequently patients have estimated the time as from 15 to 20 minutes; now and then a patient has estimated the time as six hours.

As with all kinds of analgesia requiring the cooperation of the patient, contraindications are determined mainly by the attitude of the patient. Extremely apprehensive individuals make poor subjects for all types of analgesia. Yet, with proper explanation of the method, it is frequently possible to employ this method even with nervous patients. If needed, some light sedation may be given. Once analgesia has been established, nervousness is allayed, and such patients relax physically and mentally as others initially more stolid. The success in these cases depends in no little measure on the skill of the administrator and the gentleness of the dentist. Children in general make poor subjects for trichloroethylene analgesia; much depends on the age and cooperation of the child. When it is felt that epinephrine infiltration is essential for successful surgery, trichloroethylene is absolutely contraindicated.

Much of the success of this method depends on good teamwork. Gentleness on the part of the operator is essential, and heavy pressure in the drilling of cavities must be avoided. The dentist must be patient and wait for the onset of satisfactory analgesia before he begins his work. Beginning work too early may ruin the whole procedure and destroy the patient's confidence in the method. Proper selection of cases likewise is essential. It may be well for the dentist to experience analgesia himself at least once so that he may be fully acquainted with a patient's sensations during analgesia.

ADVANTAGES AND DISADVANTAGES

Advantages • The advantages of trichloroethylene analgesia are as follows:

1. Trichloroethylene is nonexplosive and nonflammable in air. The range of flammability of trichloroethylene in oxygen is beyond clinical concentrations.
2. Trichloroethylene is economical. One filling of the inhaler suffices for about three hours' work.

3. The method of administration is simple, and skill is readily acquired after proper supervised instruction and study.

4. The onset of analgesia is rapid; analgesia is frequently established in about five minutes.

5. Analgesia with trichloroethylene is deeper than with nitrous oxide, and amnesia is pronounced. It is interesting to note that some patients said they did not get as much relief from pain as they would have wished; but when it was suggested to them that the method would not be used on them the next time, they objected vigorously.

6. Control of analgesia is easy, and the concentration of the drug can be adjusted readily.

7. The method is safe; there is little chance of harm coming to the patient as a consequence of the correct use of trichloroethylene as an analgesic. Reactions such as may be seen from the use of local anesthetics do not occur.

8. Undesirable side effects such as nausea, vomiting or other respiratory or vascular phenomena are exceedingly rare with the concentrations employed for analgesia. Excitement is not likely to occur unless the depth of analgesia is excessive.

9. The equipment is light, portable and not bulky and requires no heavy tanks. There is no obstruction of the operative field by the small nasal mask. The equipment is efficient and requires little upkeep and repair.

10. Trichloroethylene is compatible with all local anesthetics, which may be used simultaneously for extremely painful procedures such as preparation of a root canal provided that such local anesthetic drugs contain no contraindicated vasoconstrictor.

11. Trichloroethylene analgesia can be used for the vast majority of adult patients.

12. The patient is relaxed and comfortable during operation.

13. Premedication is not required for most cases.

14. Recovery from the analgesia is rapid.

15. Additional personnel is not required to administer the analgesic.

Disadvantages • Among the relatively few disadvantages of trichloroethylene analgesia are the following:

1. Epinephrine and similar vasoconstrictors cannot be used in conjunction with trichloroethylene.

2. Trichloroethylene has an odor, which, however, most individuals do not consider unpleasant. If care is taken in adjusting concentrations, there is rarely any objection to the odor. At first some dentists, too, may find the odor objectionable, but they soon cease to notice it.

3. Trichloroethylene is a potent agent so that the stage of excitement or the stage of general anesthesia may supervene; however, as the administrator gains experience, such an event will occur with ever decreasing frequency. The more adequate the instruction of the administrator in the use of the method, the fewer will be his errors in clinical application.

SUMMARY

In trichloroethylene analgesia the dentist is provided with a means for relieving pain during all types of minor surgery. The method has distinct advantages over local anesthesia, as it provides mental and physical sedation, tranquility and amnesia, and does not have untoward reactions and side effects. The technic is almost universally applicable and can be learned easily. Experience with over 250 cases demonstrates the potential usefulness of trichloroethylene as a general analgesic in dentistry.

A clinical study of the forces required to dislodge maxillary denture bases of various designs

E. W. Skinner, Ph.D.; R. L. Campbell,† D.D.S., M.S.D., and Paul Chung,‡ D.D.S., M.S.D., Chicago*

Although the problem of the retention of complete dentures has often been investigated and, according to Schlosser, is "considered one of the most difficult problems confronting the prosthetist,"[1] it remains almost as controversial a subject as it was at the beginning of the eighteenth century. The true nature of the forces involved is not much more completely understood today than it was in that bygone era when Fuller, a London dentist, first mentioned the word "adhesion" and described it as a means of holding upper dentures *in situ*.[2] In early nineteenth century America, atmospheric pressure was considered the factor of major importance, as is evidenced by a lively discussion in the literature of the most efficacious designs for vacuum chambers and "cavity plates"[3] and by the number of pages devoted to the subject in a description by Richardson,[4] one of the foremost authorities of the day. More recently, this theory was substantiated by experiments carried on in a decompression chamber,[5] which indicated that the lower the pressure, the less was the retention of the denture.

A modern concept of denture retention is perhaps best exemplified by the work of Stanitz,[6] who utilized the classic analogy of two glass plates pressed together with a layer of fluid between them to exemplify the denture in the mouth, seated on the fluid film. He derived a formula applicable to any fluid film, by which the force necessary to dislodge a denture can be determined mathematically if the area of the plate and the thickness of the fluid film are known. The formula is:

$$F = \frac{2CA}{a}$$

where F is the force, C the coefficient of surface tension, A the area of the plate, and *a* the thickness of the fluid film. The interpretation of this formula

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*Professor of physics, Northwestern University Dental School.

†Graduate student, Northwestern University Dental School.

‡Assistant professor of prosthetic dentistry, Northwestern University Dental School.

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is that the retentive force is directly proportional to the area of the surface of the denture and inversely proportional to the thickness of the fluid film between the denture and the mouth tissues. Actually, the retention by the fluid film is the result of the pressure difference across the meniscus of the film as related to the differential effect of the air and fluid pressures.

A second modern viewpoint, of importance because it is the basis for the widely publicized "static principle" of impression-taking, has been advanced by Page,[7] who seeks in his writings to "expose the fallacy of atmospheric retention" as well as the principle of "adhesive or cohesive retention." According to Page, the real factor in denture retention is the interfacial surface tension which acts through a thin fluid film between two closely contacted objects. Such a desirable condition of close and uniform tissue contact of dentures, he postulates, is attainable only through a method of impression-taking which will produce "an impression and denture base which are accurate negatives of the ridge tissues in their normal, passive form."

Few controlled experiments on the retentive forces of a denture have been reported. Östlund[8] and Chung,[9] in experiments somewhat similar to those of Greve,[10] constructed baseplates to fit a model of elastomer resin which simulated the soft tissues of the upper arch. A dislodging force was then applied perpendicularly to the plane of the denture base. The magnitude of the force applied to dislodge the baseplate was assumed to be a measure of its retention. Östlund found that the greater the surface tension and the thinner the fluid film, the greater was the retention of the denture. He concluded, however, in agreement with Stanitz, that the effect of surface tension was secondary to that of atmospheric pressure. Chung studied the effect of the post-dam, the peripheral seal and relief areas on retention.

MATERIALS AND METHODS

The object of the research herewith reported was to investigate clinically, in the mouth of a subject, the forces required to dislodge maxillary denture bases of various designs, including the effects of a post-dam, a peripheral seal, relief areas and the area of contact.

Special care was taken to select a prosthetic case which would be suitable for these experiments. Since the retention of the denture base was to be studied as a physical phenomenon, any mechanical retention due to undercuts or other similar conditions had to be eliminated. The mouths of many patients were examined before a maxilla of the proper form, without undercuts, was found.

Two master impressions were obtained. One impression was taken with alginate impression material in an attempt to obtain an impression with the least possible pressure. The other impression was obtained by using a zinc-oxide eugenol impression paste as a "wash" on a muscle-trimmed impression made with compound. Master stone casts were constructed from each of the impressions. Duplicate casts for processing baseplates were obtained with a hydrocolloid duplicating material.

Acrylic resin baseplates were constructed on the duplicate stone casts as illustrated in Figure 1. Staplelike retentions were processed in the acrylic resin (Fig. 1). The dislodging forces were later applied to these staples, or eyes, by means of hooks attached to the loading device.

As can be noted in Figure 1, four baseplates were constructed. Two were constructed in the usual manner, Plate 1

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from a duplicate of the cast from the paste-wash impression and Plate 2 on a duplicate cast from the alginate impression. In Plate 3, the labiobuccal surfaces of the baseplate were omitted. It is estimated that the bearing surface of the baseplate was reduced approximately 25 per cent in area by this omission.

Plate 4 (Fig. 1) was constructed as a roofless denture with the palate portion omitted. It is estimated that the bearing surface was reduced 25 per cent by this omission. Plate 5, a roofless plate, which is not illustrated, was constructed with its bearing surface reduced approximately 35 per cent from that of the original baseplate.

The apparatus for measuring the retention of the baseplates (Fig. 2, left) provided a system whereby force could be applied at right angles to the plane of the denture being tested, regardless of the eye to which attachment was to be made. The force was applied by means of a heavy nylon fish line, which was suspended perpendicularly from the eye in the area to be tested and then was carried around a pulley and through a hollow brass rod where it was attached to a spring dynamometer. The force was applied by pulling on the dynamometer, and a reading was then taken. It was assumed that the force in ounces avoirdupois necessary to unseat the denture was a measure of its retention.

In order to insure that the forces were applied as nearly perpendicular to the plane of the denture as possible, when-

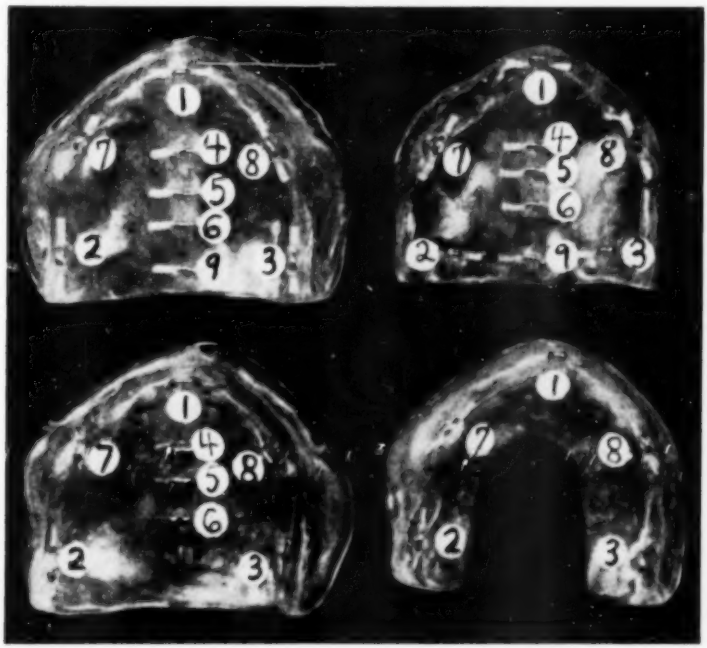

Fig. 1 • Baseplates 1, 2, 3 and 4, showing position of eyes. Above left: Plate 2, made from alginate impression. Above right: Plate 3, made with no flange. Below left: Plate 1, made from paste-wash impression. Below right: Plate 4, roofless baseplate

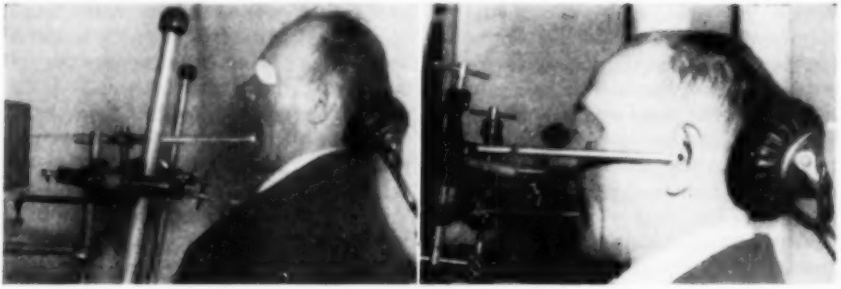

Fig. 2 • Left: Subject, with tube, pulley and measuring mechanism in place. For photographic purposes, sagittal bars are missing. Right: Parallel bars in place to align head

ever the patient was seated, special care was observed to align the head in the same position each time. In order to accomplish such an alignment, the headrest of the dental chair was utilized together with a pair of metal rods, one extending along each cheek parallel to the brass tube which extended into the mouth (Fig. 2, right). These rods could be aligned parallel to a plane drawn with indelible pencil from the ala of the nose to the tragus of the ear. In this manner, the head of the patient could be repositioned in essentially the same position in reference to the measuring apparatus whenever an experiment was performed.

When a baseplate was to be tested, the patient was seated in the chair, and the head was adjusted as described. The plate was placed in the mouth by the operator, using manual pressure for five seconds. It was then left in position for two minutes before any force was applied. The brass tube was positioned to carry the pulley to a point directly under the eye selected for testing, and the rest of the apparatus was adapted to conform to this location. The load was then applied. Each result presented in the data is an average of at least five trials.

In addition to the effects of the method of impression-taking and of the area of the baseplate, the effects of the absence or presence of a peripheral seal, of a post-dam and of a relief area on the retention of the baseplate were studied. The post-dam and the peripheral seal were attached to the various baseplates by means of a high-fusing pink wax. Relief areas of varying extent were made in the central portion of the palate to a depth of approximately 1.5 mm.

When they were not in use, all baseplates were stored in water at room temperature. No tests were made unless the baseplate had previously been stored in water for at least three weeks.

The maximum force applied during the experiments was 192 ounces (5,500 Gm.). It was considered that a force greater than this might distort the acrylic resin to such an extent that the value of the results would be questionable. Furthermore, the application of a greater force might endanger the subject.

The results are tabulated in Tables 1 and 2 and in Figures 3, 4 and 5.

EFFECT OF THE MODE OF CONTACT

The data in Tables 1 and 2 indicate that the retention of the denture base is greatest along its midline, particularly toward the anterior. As can be noted by a comparison of the areas of retention according to the eye numbers (Fig. 1), forces applied to the anterior eyes (no. 1, 4, 5, 7, 8) failed to dislodge the den-

Table 1 • Effect of the mode of contact on the retention of Plate 1

Eye no.	Direct contact	Post-dam	Peripheral seal	Relief area	Enlarged relief area	Post-dam and peripheral seal	Post-dam, peripheral seal and relief area
	oz.	oz.	oz.	oz.	oz.	oz.	oz.
1.	192+	192+	192+	192+	192+	192+	192+
2.	48.0	168.0	43.2	29.7	23.4	168.0	124.8
3.	20.8	112.0	25.6	25.4	16.3	192+	192+
4.	192+	192+	192+	192+	192+	192+	192+
5.	192+	192+	192+	192+	192+	192+	192+
6.	32.0	192+	52.8	32.5	26.0	192+	192+
7.	192+	192+	192+	192+	192+	192+	192+
8.	192+	192+	192+	192+	192+	192+	192+

ture within the maximum force applied (192 ounces); however, whenever the force was applied to an eye located in the posterior region (no. 2, 3, 6, 9), the retention was less, as indicated by the fact that the baseplate was sometimes dislodged by a relatively small force.

The effect of the additions to the baseplate in the form of a post-dam, a peripheral seal or both can be observed by comparing the retentive forces when the forces were applied to eyes no. 2, 3, 6 and 9 with those obtained when no additions had been made (second columns, Tables 1 and 2). It is evident that the most effective addition, as far as an increase in retention is concerned, was the post-dam. The retention was increased by this addition in the areas mentioned in every case. As can be noted by the data in column 4, Table 2, any reduction in the post-dam produced a decrease in retention.

It should be noted that the principal area of distortion in an acrylic baseplate is the posterior palate portion. No such distortion was visible to the eye when the baseplates employed were placed on the master casts. Nevertheless, an increase in retention in this area was obtained when the post-dam was added.

The addition of a peripheral seal (column 4, Table 1, and column 5, Table 2) produced an increase in the retention of the denture base in the areas under discussion, but it was not as effective in this regard as was the addition of the post-dam.

Contrary to arguments in favor of relief areas, this addition reduced the reten-

Table 2 • Effect of the mode of contact on the retention of Plate 2

Eye no.	Direct contact	Post-dam	Post-dam reduced	Peripheral seal	Relief area	Post-dam and peripheral seal
	oz.	oz.	oz.	oz.	oz.	oz.
1.	192+	192+	192+	192+	192+	192+
2.	26.8	192+	92.8	57.0	18.6	99.2
3.	33.6	192+	73.2	44.4	24.8	155.2
4.	192+	192+	192+	192+	192+	192+
5.	192+	192+	192+	192+	192+	192+
6.	53.3	163.2	65.6	44.0	20.5	150.4
7.	192+	192+	192+	192+	192+	192+
8.	192+	192+	192+	192+	192+	192+
9.	18.8	72.0	62.8	26.0	17.1	64.0

tion of the denture base. (Compare column 5, Table 1, and column 6, Table 2, with column 2 in both Tables 1 and 2.) Enlarging the extent of the relief area reduced the retention even more, as can be noted from the data presented in column 6, Table 1. Thus, in agreement with the theory of Stanitz,[6] the addition of a relief area apparently increased the thickness of the fluid film and reduced the retention.

Comparison of data in column 7 (Table 1) and columns 3 and 4 indicates that addition of both a post-dam and a peripheral seal increases retention more than either alone, though effects are not mathematically additive.

ALGINATE IMPRESSION COMPARED WITH PASTE-WASH IMPRESSION

No important differences can be noted when the total data in Table 1 are compared with similar data in Table 2. In general, it appears that the retention of Plate 1 (Table 1) was greater than that for Plate 2 (Table 2) in areas where the baseplate could be dislodged; however, the differences are so minor that a number of repeated trials with separate impressions and baseplates would be necessary to establish the validity of such differences.

Throughout the entire discussion, the conclusions drawn have been based on

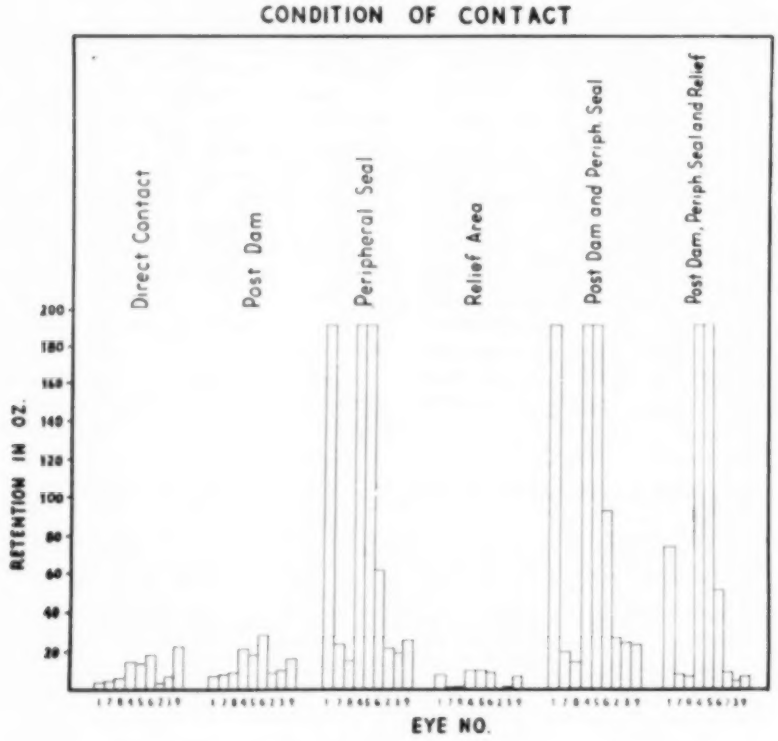

Fig. 3 • Retention of Plate 3 (no flange)

the retention in the posterior areas only, since the denture base could not be dislodged in the anterior areas. Forces as high as 28 pounds were applied to the anterior areas with no dislodgment of the denture. Since the subject complained of a pain resembling toothache when excessive force was applied, the maximum force was finally limited to 192 ounces for this reason and other reasons previously stated. It is evident that a lack of retention in a denture is due to poor adaptation to the underlying tissues or to poor lateral balance so that the denture is dislodged by a leverage action. Certainly, a well-fitting denture is not readily dislodged in function by a force perpendicular to its anterior portion.

THE EFFECT OF THE LABIOBUCCAL FLANGE

The effect of reducing the area of contact of the denture is illustrated by the data presented in Figure 3. In this case, Plate 3 with no flange was used. The retention in ounces is plotted on the vertical ordinate according to eyes and types of contact.

According to the first set of data ("Direct Contact," Fig. 3), when no additions were made to the baseplate, in not a single instance was the maximum retentive force (192 ounces) attained. Furthermore, when there were no buccal or labial flanges, the reduction in retention was much greater proportionately than the estimated reduction in area (25 per cent).

The maximum retention obtained was 22 ounces on hook no. 9. Furthermore, the magnitude of the forces on a single area was observed to be somewhat erratic from one trial to the next. Apparently, the influence of the labiobuccal flanges of a denture on its retention is considerable. This conclusion is in accord with the similar findings of Chung.[8]

A study of the graph (Fig. 3) indicates

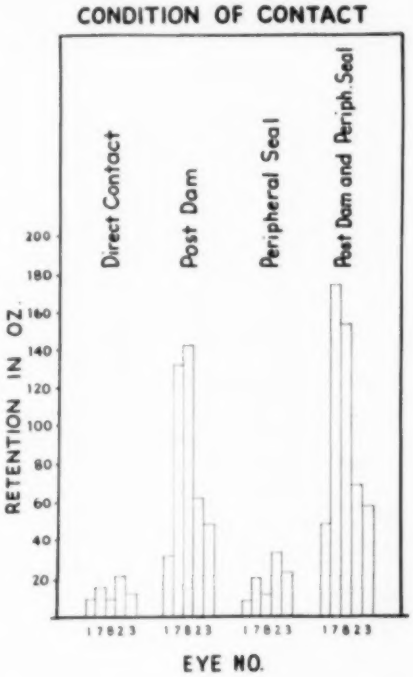

Fig. 4 • Retention of Plate 4 (no palate)

that the palate portion of the flangeless denture is the area producing the greatest retention. This fact is demonstrated by the greater forces needed to dislodge the denture when they were applied to the eyes in the palate portion (no. 4, 5, 6, 9) as contrasted with the application of force to the eyes located on the ridge area (no. 1, 2, 3, 7, 8).

The effect of the post-dam when it was applied to the flangeless denture base is illustrated in the second series of graphs (Fig. 3). Apparently, the addition of a post-dam in this case increased the retention very little. Such an observation is in disagreement with similar data obtained when the post-dam was added to the baseplates containing flanges (Tables 1 and 2). In these cases, the

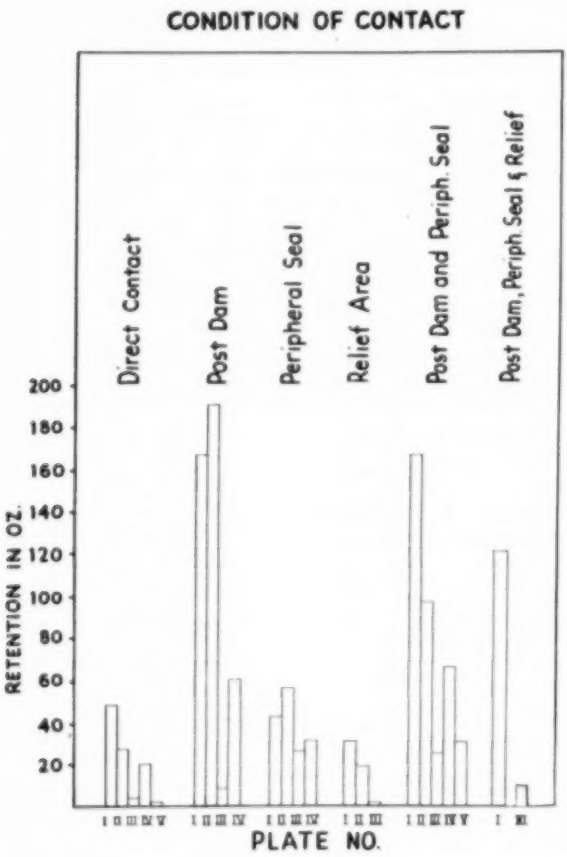

Fig. 5 • Retention of all baseplates as tested by applying dislodging force on eye no. 2

post-dam was the most effective addition in increasing retention.

The effect of the peripheral seal on the retention of the denture as indicated in the third series of graphs (Fig. 3) is considerable. Maximum retention was obtained when the dislodging force was applied to eyes in the anterior midline region (no. 1, 4, 5). In fact, the retention was increased in all areas beyond that achieved in previous attempts with this plate.

The addition of a relief area to the flangeless denture reduced the retention to the lowest values obtained in the entire study (fourth series of graphs, Fig. 3).

In the fifth series, it is evident that the addition of the post-dam to the flangeless baseplate, with the peripheral seal already present, accomplished nothing as far as any increase in retention is concerned. In fact, the data are nearly identical to those in the third series where no post-dam was used.

When the relief area was added to the post-dam and the peripheral seal on the flangeless denture (sixth series, Fig. 3), the retention in all areas was reduced below the maximum with the exception

of the midanterior palate region (eyes 4 and 5).

THE ROOFLESS DENTURE

As previously noted, the retention of two roofless baseplates was tested. Plate 4 (below right, Fig. 1) was constructed with approximately 25 per cent of the area of the complete plate omitted, and Plate 5 with 35 per cent of the area omitted.

Only the results obtained with Plate 4 are presented in detail in Figure 4. According to the graphs, only after a post-dam was added was there any considerable retention of the plate. In fact, the retention of Plate 5 was so slight without the addition of a post-dam or a peripheral seal that it could not be measured. There was sufficient retention, however, so that the patient could converse in the normal manner. It is of interest to note that the greatest retention produced by the post-dam in Plate 4 was in the cuspid region. It should be noted that the post-dam in this case extended around the entire lingual periphery, as well as across the heels of the plate.

The addition of a peripheral seal to the roofless denture was effective in improving the retention of the plate only when it was combined with the post-dam (Fig. 4).

The results obtained with Plate 5 were in general correspondence with those illustrated for Plate 4 (Fig. 4), but the retention was less in every case.

It should be noted that not even in a single instance did the roofless denture withstand the maximum force which could be applied (192 ounces). Apparently, the roofless denture has the least retention of any of the baseplates tested.

COMPARISON OF THE VARIOUS BASEPLATES

All the baseplates, with one exception, exhibited a retention of less than 192 ounces when they were dislodged in the right posterior region (eye no. 2, Fig. 1). For purposes of comparison, the retention values of all of the baseplates with all of the additions are plotted in Figure 5. The general tendency was for the retention to be improved most effectively by the post-dam and secondly by the peripheral seal, although the latter was not decidedly effective in this particular area. Addition of relief areas decreased the retention in every case.

GENERAL DISCUSSION

In general, the results obtained confirm the conclusions of Östlund[8] and Chung.[9] Chung found also that the retention of a complete baseplate was increased by the post-dam and the peripheral seal.

It is of interest that the roofless baseplate exhibited the least retention of all the plates tested. There are, of course, possible modifications which were not attempted in the present study and which might improve the retention of this type of baseplate.

The mechanism for improvement in retention with a post-dam and a peripheral seal is often described as a "seal" against the ingress of air which might unseat the denture. Since the fluid film itself would be thinner in these areas, the "seal" would not break as readily as it would otherwise.

It appears, as regards retention and the center of gravity of the plates, that the portion of the denture anterior to the center has the greatest retention. From this area posteriorly, retention decreases progressively, independent of modifying conditions, such as a post-dam and relief areas. This effect was most noticeable with Plates 1 and 2.

Retention has been shown to be decreased by a relief area such as is often used in present-day dentistry. In this experiment the larger the area of relief, the poorer was the retention. These facts seem to demonstrate that atmospheric

pressure in the sense of ordinary "suction" and "vacuum chamber" does not have much influence on retention. If the analysis worked out by Stanitz[8] is accepted, the retention can be said to be reduced by relief areas through factors related to the increased thickness of the fluid film in these areas.

SUMMARY AND CONCLUSIONS

The retention of acrylic resin denture baseplates of three different designs was measured clinically under various conditions of contact, and the following facts and conclusions were demonstrated:

1. The introduction of relief areas resulted in a decrease in retention, regardless of what other factors were present which might have tended to increase it. Probably this decrease can be attributed to an increase in the thickness of the fluid film. An increase in the area of relief further decreased retention.

2. In the case of the complete denture bases, the post-dam was more effective in increasing retention in certain areas than was the peripheral seal, but both increased retention whether they were used singly or together. In the case of the flangeless baseplate, however, only the peripheral seal was effective in increasing retention. In the case of the roofless denture, the post-dam increased retention approximately four times as much as the peripheral seal.

3. The flangeless denture exhibited less retention than the complete denture base, regardless of the additions. Furthermore, the results obtained with this denture were somewhat erratic from one trial to another. Consequently, it can be concluded that the flanges possess an important stabilizing influence.

4. The roofless denture—although quite consistent results were obtained—exhibited the poorest retention of any of the plates.

5. No significant difference in retention was found as related to the two methods of impression-taking employed.

Recognition of Science • Not science, but the neglect of science is irreligious; devotion to science is a tacit worship—a tacit recognition of worth in the things studied; and by implication in their cause. Only the genuine man of science can truly know how utterly beyond not only human knowledge, but human conception, is the Universal Power of which Nature and Life and Thought are manifestations. *Herbert Spencer, "Education," 1861.*

Radiation hazards to the patient from oral roentgenography

William E. Nolan, Berkeley, Calif.

In spite of the necessity for the use of roentgen rays in dentistry, as yet little has been done to protect the patient and the dentist from unnecessary overexposure. This paper is limited to the discussion of radiation hazards with respect to the patient.

During the preliminary examination, the patient, in most instances, is subjected to a full mouth roentgen-ray examination, which entails the taking of 15 to 35 roentgenograms, depending on the technic used. In view of the fact that little work has been done in this particular field, it was decided that an effort should be made to ascertain the danger of overexposure to the patient.

METHOD AND DEFINITIONS

The amount of radiation delivered to the patient during the taking of roentgenograms depends on the following factors:

1. The energy of the roentgen rays.
2. The focal distance (distance between the tube target and the skin).
3. The amount of filtration.
4. The amount of current.
5. The total time the patient is exposed.
6. The type of collimation.
7. The type of film.

The energy of the roentgen rays is important, as it is a major factor in determining both the rate at which the radiation is being delivered and the depth of penetration. In the energy range in which dental equipment is operated (50-100 kv.), the higher the energy, the greater the rate of delivery, and, of course, the greater the energy, the greater the depth of penetration.

In general, there are two focal distances used. One technic employs an 8-inch focal distance, the other technic a 16-inch focal distance. With the 8-inch distance, the exposure time is shorter as compared with the 16-inch distance; but the total amount of radiation delivered to the patient can be as high as from three to four times that which is delivered when the longer focal distance is used. It would seem that the dosage delivered to the patient would be the same in both cases and that the exposure time with the 8-inch distance should be a fourth of that with the 16-inch distance; however, this is not the case. In most cases the total exposure time when the technic with the 8-inch distance is employed is only about 35 per cent shorter than the time used when the technic with the 16-inch distance is employed.

The amount of filtration used with dental machines is very important. In many instances no filtration is used. The failure to filter out all soft radiation increases the dosage tremendously. Most

Radiation laboratory, department of physics, University of California.

machines examined in this study were using a current of 10 ma.

The total time of exposure varies, depending on the technic employed; it may be as short as 50 seconds and as long as 1 minute, 35 seconds. This is no doubt the most important factor in determining the total dose delivered to the patient.

Collimation is supplied by a 1/16-inch lead diaphragm with precisely the correct diameter opening to allow just enough of the roentgen-ray beam through to cover the area being investigated. Therefore, the operator must be extremely careful in positioning the cone and the film to prevent cone cutting. This is a very important consideration as it defines the region being irradiated.

The type of film used also is important. Recently a new type of film has been developed; latest reports on its use at the University of California School of Dentistry are most encouraging. Since it is a much faster film, there is a considerable reduction in the exposure time.

Radiation dosages, in most cases, are expressed in roentgen units. The term roentgen (or r as used hereafter) is defined as follows: that amount of x or gamma radiation producing in 1 cc. of air ions carrying 1 electrostatic unit of charge of either sign. The r is equivalent in energy to 93 ergs per gram average in tissue and results in 1.615×10^{13} ion pairs per gram tissue. At the present time the accepted weekly tolerance dose for x or gamma rays is 0.3 r per week. This dose, of course, pertains to total body exposure and specifically excepts any possible genetic effects.

In this study the primary standard for measuring roentgen-ray dosages in the energy range (50-100 kv.) common in the dental field was the Victoreen Condenser r-meter and a nylon thimble chamber. These measurements were supplemented by the use of a special type of film that is commonly used to measure radiation dosages (Du Pont no. 558). The film was used to determine the skin dose delivered to various anterior and lateral surfaces of the face, neck and chest.

This determination was accomplished in the following manner. Films were placed in contact with and completely surrounding the patient's neck. In addition, films were placed also at 12 locations on the anterior surface of the body between the neck and the waist. This technic was used with three patients. The density of these location films was compared directly with the density on standard exposure films by means of a Photovolt Densitometer. The measurement pertaining to the rate at which the dose is delivered was repeated several times in all cases.

X-RAY UNITS EXAMINED AND RESULTS OBTAINED

Thirty-two dental units were examined in the San Francisco and Berkeley areas. The following three machines used to collect the data were assumed to be typical; as can be seen, the results varied according to the machine and the technic used.

Machine A • Machine A was operated at 65 kv., 10 ma., no filtration; the technic used called for a 16-inch focal distance. The number of exposures for a full mouth examination averaged about 30. The total time of exposure for a full mouth examination was about 90 seconds. The rate of delivery was 75 r per minute or a total of 113 r delivered to the region during a full mouth examination.

Machine B • Machine B was operated at 45 kv., 10 ma., no filtration; the technic called for an 8-inch focal distance. The number of exposures for a full mouth examination was about 25. The total exposure time was about 70 seconds. The rate of delivery was 270 r per minute or a total of about 315 r to

the region during a full mouth examination.

Machine C • Machine C was operated at 65 kv., 10 ma., no filtration, and an 8-inch focal distance. The number of exposures for a full mouth examination was about 28. The total exposure time was approximately 75 seconds. The rate of delivery was 190 r per minute or a total of about 238 r delivered to the region during a full mouth examination.

After a 2 mm. aluminum filter had been installed, an examination of Machine B was made, with all other operating conditions remaining the same. The rate of delivery was reduced to 40 r per minute as compared with 270 r per minute without filtration. The roentgenograms were of much finer quality than those made previously because much of the softer radiation that tends to fog the film was eliminated.

For all three machines when film was used to measure the dosage to various lateral and anterior surfaces of the body, it was determined that the dose delivered to any region below the shoulder line did not exceed 2 r. In the region of the face and neck the dose delivered was much greater and in the cases studied exceeded 75 r to both lateral surfaces and somewhat less to the anterior surface. This measurement also was obtained with film.

In the region of the neck there is a large amount of lymphatic tissue. Since this tissue is most sensitive to radiation,[1] it was thought that with such high dose rates there might be changes in the blood pictures of patients undergoing roentgenographic examinations.

At the present writing, ten patients have been observed hematologically. The ten patients who received full mouth roentgenographic examinations were exposed to the following amounts of roentgen-ray radiation: 35 r, 115 r, 135 r, 65 r, 315 r, 315 r, 285 r, 282 r, 285 r, 280 r. The last six amounts represent dosages delivered to patients exposed to Machine B. With the exception of the patient who received only 35 r, all showed significant changes in blood pictures.

DISCUSSION OF RESULTS

It can be seen from these data that a considerable amount of radiation is absorbed by the patient. The exposure is not confined entirely to the region of which roentgenograms are taken but extends over a much larger region. It can be seen also that excellent roentgenograms can be obtained without exposing the patient to unnecessary high doses of radiation. It should be pointed out that the total amount of radiation delivered to the patient is delivered to a region embracing the entire jaw and neck region. To any 1 square centimeter of skin surface the dose will, in most cases, not exceed 100 r. It should also be pointed out, however, that there are many intersecting lines of radiation within the neck and oral cavity, varying with the angle at which the roentgenograms are taken. These points of intersection are definitely points of high ionization.

The results of the hematological studies have not yet been published.[2] For the present, it can be said that significant blood changes have been observed in patients exposed to full mouth roentgenographic examinations.

Two other points that should be mentioned are the following: A patient could conceivably be exposed several times to a full mouth roentgenographic examination within a short period of time. In many cases, the entire upper portion of the body is bathed in radiation to a greater or less degree.

1. Ingram, M., and Mason, W. B. The effects of acute exposure to roentgen radiation on the peripheral blood of experimental animals. University of Rochester, A.E.C. Report UR 122, July 17, 1950.

2. Nolan, W. E.; Dobson, R. L., and Chupp, M. M. Hematological effects observed in the peripheral blood of patients who have undergone full mouth radiography. Unpublished report.

RECOMMENDATIONS

In the future, the use of roentgen rays as a diagnostic tool will certainly increase rather than decrease, both in the medical as well as in the dental profession. In view of this trend it seems logical that the dentist should give careful consideration to all factors involved before ordering full mouth roentgenograms. The patient should be questioned with respect to prior roentgenographic examinations of any nature. It might be well to bear in mind that the present belief is that ionizing radiation of all types has a cumulative biological effect.

Personnel who presumably will be engaged for many years in a profession necessitating their working with various types of radiation and radioactive materials should avoid having routine full mouth roentgenograms.

It is entirely possible that a patient could be undergoing roentgenographic examination of some other portion of the body during the same period that oral roentgenograms are being taken. In some cases, such a double exposure could be very objectionable. A record of exposure should be kept of all persons undergoing roentgenographic examination of any type.

All personnel whose profession requires them to use x-ray equipment of any kind should be completely familiar with the equipment with respect to the kv. used, the currents used, the filtration employed, if any, and, of course, the r output of the unit.

The following recommendations are made in regard to the dental unit itself: (1) All dental units should be equipped with proper filtration. (2) The roentgen-ray beam should be collimated so as to cover precisely the region of which roentgenograms are to be taken. (3) A long focal distance should be used at all times. (4) The shell housing the tube should be roentgen-ray proof. (Many in use at the present time are not.) (5) It might be profitable to investigate some new film technics, such as the impregnation of the emulsion with a material that would fluoresce on being irradiated. A piece of calcium tungstate might be included as an integral part of the film packet. (6) It might be worth while also to consider a shield of some sort to protect the patient's neck from secondary and scattered radiation.

CONCLUSION

At the present time, there are thousands of dental x-ray units in use which are unsafe both for the patient and for the operator. The following simple modifications in construction and in use would render most of these machines comparatively safe:

1. If it is ascertained by examination with the cone removed that an aluminum filter is not being used, a filter of at least 0.5 mm. of aluminum should be installed.
2. If a collimator is not being used, one should be installed. The collimator should be a diaphragm 1/16 inch thick with precisely the correct diameter opening to allow just enough of the roentgen-ray beam through to cover the region being investigated.
3. The long-cone technic should be used for all routine examinations.
4. The shell housing the tube should be roentgen-ray proof.
5. It may be worth while to consider a shield of some sort to protect the patient's neck from secondary and scattered radiation.

The manufacturer can do much to eliminate the potential hazard if he will build in as an integral part of the dental unit the features designated in these recommendations.

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

The 1953 survey of dental practice

I. Introduction

The purpose of the 1953 Survey of Dental Practice is to obtain information which is needed in connection with various problems facing the profession and which is beneficial to the profession in many ways. Some of the uses of this type of information can be identified and listed; other benefits are of an incidental type, too numerous and too unpredictable to specify.

Information derived from this survey will help in detecting efficient and inefficient characteristics of dental practices. For instance, the analysis will show how the income of dentists varies with such factors as length of patient appointments, personnel employed, and office equipment owned.

Statistics on income, expenses, and number of patients, broken down geographically, are of assistance to the dentist seeking a location. Maldistribution is the most serious problem today with respect to the supply of dental services. Publication of the facts regarding dental practice in the various states and regions will tend to rectify the maldistribution.

Each year, dozens of bills involving dentistry are thrown into the legislative hoppers of federal and state governments. There is no substitute for factual information in countering ill-conceived legislation and in supporting sound legislation.

Facts such as those covered in this survey are useful in planning dental health programs of the type advocated by the American Dental Association. If a community is to estimate how many dentists it should have, statistics on working hours and patient loads are among the facts needed.

Experience has shown that many unforeseen uses for statistics of this type will arise. For example, much of the information gathered in the 1950 Survey of the Dental Profession was published in the final report of the President's Commission on the Health Needs of the Nation in 1951. Without the results of this survey, there would have been a conspicuous absence of dental statistics.

The Association frequently is called on to furnish sundry types of data to numerous agencies and individuals, from government departments to advertising agencies and from free-lance writers to practicing dentists.

In May 1953, the questionnaire, shown elsewhere in this article, was sent to every third civilian dentist throughout the United States, including both members and nonmembers of the Association. Accompanying the questionnaire were a letter explaining the purposes of the survey, a business reply envelope, and a business reply postcard with which the dentist could indicate he had cooperated in the survey and request an advance copy of important results of the survey.

By the cut-off date, August 7, after which questionnaires received could not be included in the analysis, approximately 5,000 dentists had returned questionnaires, representing about 18 per cent of

AMERICAN DENTAL ASSOCIATION, 222 E. Superior St., Chicago 11

Bureau of Economic Research and Statistics

The 1953 Survey of Dental Practice

CONFIDENTIAL

It will be easier and faster for you to fill out this questionnaire if you will read it through to the end before starting to answer the questions.

Answers in the squares may be indicated with a check mark √.

For the questions which are answered by filling in a number, IF THE ANSWER IS ZERO PLEASE WRITE IN A "0", rather than leaving the space blank.

A good estimate is better than no answer. If it is not possible to answer a question, write in "NA" (*which will indicate that the information is "not available" or that the question does not apply to you*).

Disregard code numbers in the right margin. They are merely to facilitate tabulation of answers. (1-5)

(6-7)

1. Year of birth_____ 2. Year of graduation from dental school_____ (8-9)

3. Sex: ☐ Male ☐ Female (10)

4. Indicate the state and size of city in which you received the largest portion of your dental income in 1952:

State_____ (11)

SIZE OF CITY:

☐ Under 1,000	☐ 5,000—10,000	☐ 100,000—250,000
☐ 1,000—2,500	☐ 10,000—25,000	☐ 250,000—500,000
☐ 2,500—5,000	☐ 25,000—50,000	☐ 500,000—1,000,000
	☐ 50,000—100,000	☐ Over 1,000,000

5. If the largest portion of your 1952 dental income was in one of the following large cities, please indicate: (12)

☐ New York, N. Y.	☐ Los Angeles, Calif.	☐ St. Louis, Mo.
☐ Chicago, Ill.	☐ Detroit, Mich.	☐ Washington, D. C.
☐ Philadelphia, Pa.	☐ Baltimore, Md.	☐ Boston, Mass.
	☐ Cleveland, Ohio	☐ San Francisco, Calif.

6. Indicate the approximate percentage of your total net dental income in 1952 received from the types of dental practice or dental work listed below (*should add to 100%*): (*The term "independent practice" includes all dentists in private practice except dentists employed by other dentists.*)

Independent practice without partners and with no sharing of costs of offices, assistants, etc. _____ % (13)

Independent practice without partners, but sharing costs of offices or assistants, etc. (*without dividing net income on a percentage basis*) _____ % (14)

Independent practice as a partner in a complete partnership (*net income divided among partners*) _____ % (15)

Employed by another dentist (*on salary, commission, or percentage*) _____ %

In armed forces _____ %

On staff of dental school _____ %

Other position as salaried dentist (*specify*) _____ _____ %

TOTAL 100%

PLEASE RECORD YOUR 1952 DENTAL INCOME AND EXPENSES IN ITEMS 7 THROUGH 11. When listing amounts, please omit cents.

Payments to employees made on a commission or percentage basis should be regarded the same as salary. Dentists in independent practice who pay assistant dentists or dental hygienists on this basis should include these amounts in both gross income and professional expenses.

If you pay yourself a "salary" or if you are in partnership and receive a "salary" before remaining income is divided among partners, RECORD SUCH INCOME IN ITEM 7 (not in item 10).

7. Gross receipts from independent practice (*exclude pay received as a salaried employee*) $_____ (16-18)

8. Total professional expenses of independent practice (*if you shared expenses, enter only your share*) $_____ (19-21)

9. Net income from independent practice before paying income taxes (*this amount should equal item 7 minus item 8*) $_____ (22-24)

10. Salary (including commissions) received by you as an employed dentist (*before deductions for income taxes, social security, bonds, etc.*) $_____ (25-27)

11. Your total net income from all dental work before paying income taxes (*should equal the sum of items 9 and 10*) $_____ (28-30)

12. Of your total gross receipts from independent practice in 1952, approximately what percentage was in payment for the following types of dental services? (*If this information is not available and you cannot make a good estimate, write in "NA".*) (31-32) (33-34) (35-36) (37-38)

Fillings (including inlays)	____%	Orthodontic treatment	____% (39-40)
Crowns, bridges and dentures	____%	All other dental work	____% (41-42)
Oral surgery (including extractions)	____%	TOTAL	100%
Periodontal treatment	____%		

13. Professional expenses of independent practice during 1952 (*please omit cents when listing amounts*):

Office rent (*if you own your office, please estimate*)	$_____ (43-45)
Utilities (*light, gas, telephone*)	$_____ (46-48)
Depreciation on equipment	$_____ (49-51)
Insurance (*liability and equipment*)	$_____ (52-54)
Travel to professional meetings, society dues, journals, etc.	$_____ (55-57)
Commercial prosthetic laboratory charges	$_____ (58-60)
Dental supplies, drugs, etc. (*not equipment or office supplies*)	$_____ (61-63)
Dentists employed by you	$_____ (64-66)
Dental hygienists	$_____ (67-69)
Dental technicians	$_____ (70-72)
*Dental assistants (*chairside*)	$_____ (73-75)
*Secretaries and receptionists	$_____ (76-78)
Other expenses (*laundry, office supplies, office maintenance, etc.*)	$_____ (6-8)
TOTAL expenses (*should be same as item 8*)	$_____ (9-11)

**An employee who acts as a secretary or receptionist, but also provides some chairside assistance, should be counted as a dental assistant.*

14. Indicate the number of auxiliary personnel employed by you during 1952. (*A person who did not work full time or did not work during the whole year should be counted as a fraction. Thus, a half-time employee, or an employee who worked six months, should be recorded as "½".*) (12-13) (14-15) (16-17)

Dentists	_____	Dental assistants (*chairside*)	_____ (18-19)
Dental hygienists	_____	Secretaries and receptionists	_____ (20-21)
Dental technicians	_____		

15. How many weeks did you work as a practicing (*chairside*) dentist in 1952 (*regardless of whether full-time or part-time*)? _____ weeks (22-23)

16. Answer this question only if you engaged in types of dental work other than chairside practice, such as teaching, administration or research, during part or all of 1952:

How many weeks did you work as a dentist in 1952, counting all types of dental work (*regardless of whether full-time or part-time*)? _____ weeks (24-25)

17. How many weeks did you spend on vacation in 1952? _____ weeks (26-27)

18. How many days were you absent from work in 1952 because of illness or other disability? _____ days (28-30)

19. For the average week you worked as a practicing (*chairside*) dentist in 1952, estimate the number of hours normally spent as follows:

Hours at the chair	_____ hours per week	(31-32)
Hours in the laboratory	_____ hours per week	(33-34)
Other hours in dental office	_____ hours per week	(35-36)
TOTAL hours in dental office	_____ hours per week	(37-38)

20. How many DIFFERENT patients (*individuals*) did you treat or examine during 1952? (*Include patients treated or examined by employed dentists and dental hygienists.*) _____ patients (39-43)

21. How many patient visits (*sittings*) did you and your employees have in 1952? _____ sittings (44-48)

22. What was the *usual* length of your patient appointments in 1952? (49)

- ☐ 30 minutes
- ☐ 45 minutes
- ☐ 1 hour
- ☐ 1½ hours
- ☐ 2 hours
- ☐ Other (*specify*)_____

23. During 1952, approximately how long did your average patient have to wait for an appointment (*excluding emergency cases and patients who have been scheduled for a series of treatments*)?

- ☐ One or two days
- ☐ Three to six days
- ☐ One week
- ☐ Two weeks
- ☐ Three weeks (50)
- ☐ Four weeks
- ☐ Five weeks
- ☐ Six weeks or more

24. If you were an independent dentist during 1952, which of the following statements comes closest to describing your practice for the year as a whole? (51)

☐ Because of the length of your appointment list, some persons who contacted you for dental care actually obtained this care from another dentist.

☐ You provided dental care for all who requested appointments, but you felt more rushed and worked more hours than you would have liked.

☐ There was a good balance between the number of persons who contacted you for dental care and your ability to provide this care.

☐ You did not have as many patients as you would have liked. If so, about how many more patients would you have liked? _____ patients (52-54)

25. Were you a member of the AMERICAN DENTAL ASSOCIATION in 1952?
☐ Yes ☐ No (55)

26. How many dental chairs in your office were used by you and your employees in 1952?
_____ chairs (56)

27. Did you have X-ray equipment in your office in 1952?
☐ Yes ☐ No (57)

28. Did you have equipment for administering general anesthesia (*gas*) in your office in 1952?
☐ Yes ☐ No (58)

29. What percentage of your 1951 gross charges remains uncollected? _____% (59-60)

30. In what type of practice were you engaged in 1952?
☐ General practitioner ☐ Specialist (61)

If you were a specialist, mark one specialty below:

☐ Oral surgeon ☐ Prosthodontist (62)
☐ Orthodontist ☐ Oral pathologist
☐ Pedodontist ☐ Public health dentist
☐ Periodontist ☐ Other (*specify*) _____

31. Suppose you were hiring a dental assistant, and there were prospects available with the following backgrounds. Which would you prefer?

☐ Training in a school for dental assistants (63)
☐ Experience as an assistant in a dental office
☐ Clerical training (*typing, bookkeeping, etc.*)
☐ Other (*specify*) _____

32. If you believe that training in a school for dental assistants is desirable, how long a course do you recommend? (64)

☐ One academic year (*9 months*), full-time (*or equivalent*)
☐ One-half academic year (*4½ months*), full-time (*or equivalent*)
☐ One-third academic year (*3 months*), full-time (*or equivalent*)
☐ Three or four weeks, full-time (*or equivalent*)
☐ Other (*specify*) _____

Table 1 • Geographical distribution of all dentists and of dentists participating in the 1953 Survey of Dental Practice

Region	Percentage distribution of all dentists*	Percentage distribution of respondents
New England (Conn., Maine, Mass., N.H., R.I., Vt.)	7.3	5.4
Middle East (Del., D.C., Md., N.J., N.Y., Pa., W.Va.)	30.4	26.4
Southeast (Ala., Ark., Fla., Ga., Ky., La., Miss., N.C., S.C., Tenn., Va.)	11.2	11.2
Southwest (Ariz., N.Mex., Okla., Texas)	4.5	4.4
Central (Ill., Ind., Iowa, Mich., Minn., Mo., Ohio, Wis.)	29.3	31.0
Northwest (Colo., Idaho, Kans., Mont., Neb., N.Dak., S.Dak., Utah, Wyo.)	5.2	6.3
Far West (Calif., Nev., Ore., Wash.)	12.1	15.3
Total	100.0	100.0

*Based on count of dentists listed in 1953 American Dental Directory.

the mailing list. After excluding returns from dentists no longer active in the profession and returns that were not usable, the net sample consisted of 4,552 questionnaires.

Although the percentage of returns was satisfactory in comparison to other surveys of this type, there is always the question of whether the dentists cooperating were representative of dentists in general throughout the United States. The available evidence on this question

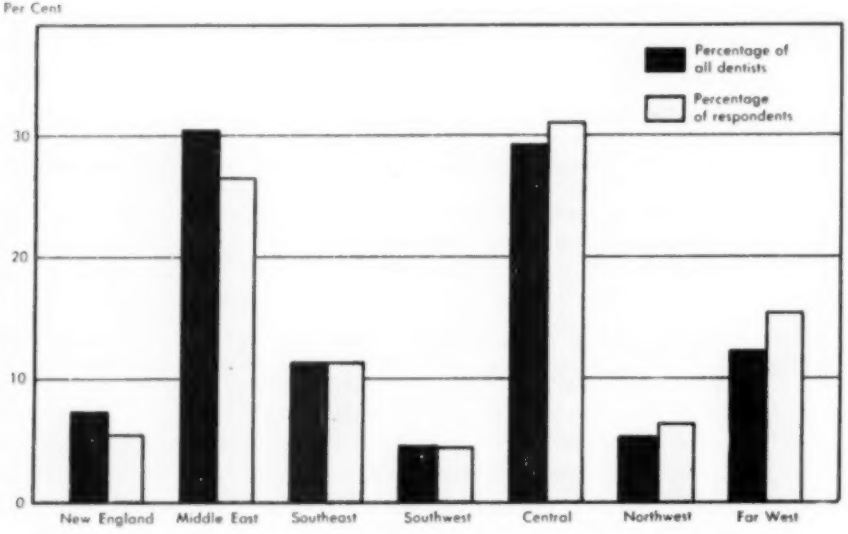

Fig. 1 • Geographical distribution of all dentists and of dentists participating in the 1953 Survey of Dental Practice

consists mainly of the distribution of respondents with respect to region, age, and membership in the Association, as compared to existing information on these three variables respecting dentists in general.

Table 1 and Figure 1 indicate that the geographic representation of the sample corresponds closely with the geographic distribution of dentists in general. As is usual in this type of survey; dentists in the Far West and Northwest tended to be represented better than average, and dentists in New England and the Middle East tended toward under-response. These deviations from the norm were relatively slight, however.

Tables 2 and 3 compare the age distribution of the survey sample with that of all dentists in 1949 and with that of employed male dentists enumerated in the 1950 census. Retired dentists were included in the 1949 distribution but not in the census figures. It appears that the representation of dentists 65 and older in the survey sample is somewhat low and that dentists in their thirties are over-represented. The large graduating classes of 1950, 1951 and 1952, consisting largely of veterans in their thirties, has undoubtedly resulted in an increase in the proportion of dentists of this age over the figures shown in the 1949 and 1950 age distributions.

Table 2 • Age distribution of all dentists in 1949 and of dentists participating in the 1953 Survey of Dental Practice

Age	Percentage distribution of all dentists in 1949*	Percentage distribution of respondents
-24	.6	—
25-29	7.3	7.2
30-34	10.4	17.7
35-39	10.9	14.4
40-44	13.0	11.0
45-49	13.7	13.7
50-54	13.6	12.9
55-59	10.6	10.6
60-64	6.8	6.4
65-69	5.3	2.8
70-74	4.4	1.7
75-	3.4	1.6
Total	100.0	100.0

*Based on a large random sample of dentists in mid 1949.

Table 3 • Age distribution of employed male dentists enumerated in the 1950 census and of dentists participating in the 1953 Survey of Dental Practice

Age	Percentage distribution of male dentists in 1950 census*	Percentage distribution of respondents
-24	.9	—
25-29	9.8	7.2
30-34	11.1	17.7
35-44	23.8	25.4
45-54	27.2	26.6
55-59	10.6	10.6
60-64	6.5	6.4
65-	10.1	6.1
Total	100.0	100.0

*From 1950 United States Census of Population, Bulletin P-C1, Bureau of the Census.

As is usual in a mail survey of dentists, nonmembers of the American Dental Association did not respond as well as members. Whereas among all active dentists about 80 per cent are members, 93.5 per cent of survey participants who answered the question regarding membership indicated they were members.

Serious consideration was given to the question of whether to "weight" the nonmembers by reproducing the punch cards on the nonmembers a sufficient number of times so that nonmembers would comprise approximately 20 per cent of the total. Between three and four duplicate sets of cards would have been required, however. It was believed that this would magnify the sampling error among the nonmembers to an undesirable extent; also, it could tend to distort the representativeness of the sample with respect to other variables. Several other reasons entered into the decision not to weight the nonmembers, including the fact that averages would be changed relatively little by so doing because of the great preponderance of Association members.

The findings of the 1953 Survey of Dental Practice will be presented serially in subsequent issues of THE JOURNAL.

B. Duane Moen, Director

BUREAU OF LIBRARY AND INDEXING SERVICE

The American Dental Association Film Library

The Film Library has purchased several prints of the films reviewed in this article since there have been so many requests for films on orthodontics or related subject matter. Any information on more recently produced films on this topic will be appreciated. The films reviewed may be rented for $2.50 each. It is suggested, however, that film users plan their programs far enough in advance to insure availability.

FILM REVIEWS

Practical Preventive Orthodontics • 16 mm., color, silent, 800 ft., 32 minutes. Produced in 1941 by Leo R. Schwartz, D.D.S., and Max J. Futterman, D.D.S. Photography by World Wide Organization of Amateur Moviemakers. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago.

The film opens with a statement of the film's purposes which are:

A. To show harmful effects to periodontal structures when there is a buccolingual displacement of teeth.

B. To show deleterious effect on occlusion when such a condition is not treated early.

C. To show a simple technical procedure for the movement of a tooth from linguoversion to a correct buccal position when there is sufficient space.

D. To show the effect on occlusion of prolonged retention of deciduous teeth.

This is followed by intraoral photographs of patients illustrating these various defects. In one instance prolonged retention of roots had resulted in a deep overbite which caused traumatic occlusion and inflamed tissues around the lower anterior teeth. In another instance where a replacement for a tooth was needed, the steps in impression taking are demonstrated. The technic for fitting bands around deciduous molars is shown clearly. The film concludes with photographs of these same patients showing all the appliances removed and the defects corrected.

Although this film is over ten years old, some of the technics are still used. It is suitable for dental students, hospital dental staffs, and general practitioners.

The Physiology of Mastication. (A Cinefluorographic Study of the Human Masticatory Apparatus in Function) • 16 mm., color, silent, 500 ft., 20 minutes. Produced in 1939 by Meyer Klatsky, D.D.S., assisted by Professor W. H. Stewart, Lenox Hill Hospital, New York. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago. No copies are available for purchase.

According to the producer, cinefluorography is the transmission to motion picture film of the image seen on the fluoroscopic screen. This film was produced to show a method of observing internal organs and systems during function, to stimulate more research on the physiology of mastication and to stress the physical effect of foods on the health and disease of the masticatory organs and teeth.

The film opens with photographs of the anatomic parts of the human masticatory organs of a subject with normal occlusion. The side-to-side movements made possible by the complex mandibular joint, the condylar movements in the articular fossa, and the up-and-down movements of the hyoid bone are clearly visible during mastication and deglutition. Experiments with soft bread, orange, hard bread, celery, steak and dry corn are illustrated through cinefluorography.

The last two scenes show two other subjects, a man who has lost his posterior teeth and has had no replacements and a woman whose lower posterior teeth have been replaced. In the former, the abnormal chewing is seen, the tongue constantly tossing the food to the anterior part of the mouth to the incisors and cuspids in order that they may perform the grinding and chewing which are normally performed by the bicuspids and molars. In the latter case, however, the replacement has restored normal mastication.

This film is well presented; although it is silent, the captions make it understandable. Technically it is not on a par with current film processing; however, this does not detract from its instructional value in a course on anatomy or orthodontics. It may interest general practitioners, dental hospital staffs, dental students, orthodontists and prosthodontists.

COUNCIL ON DENTAL RESEARCH

List of certified dental materials revised to November 15, 1953

Because there has been some confusion regarding certified dental materials, the Council on Dental Research presents this summary to clarify the operation of its certification plan.

The first fundamental item in this plan is the existence of official American Dental Association Specifications for Dental Materials. These specifications are the outcome of research by the American Dental Association Research Fellowship at the National Bureau of Standards correlated with the clinical experience of members of the Association.

As the second step in the operation of the plan, the manufacturers are invited to certify to the Council on Dental Research that their products comply with the specifications. It would be manifestly impossible for the Council (through the American Dental Association Research Fellowship at the National Bureau of Standards) to test every lot of every certified material. For this reason, the Council has required that the manufacturer, on certifying a product, not only must guarantee that this product meets specification requirements but also must furnish evidence that he maintains a testing program adequate to insure continual compliance of the product.

On receipt of a certification for a new product with all required data, the Council procures a random sample through regular trade channels, usually by asking a dentist to act as its agent. This sample is tested for compliance with all specification requirements. Only when the certification is complete and in proper form and the sample has passed all specification tests does the Council accept the manufacturer's certification. The name of the product is then added to the list of certified dental materials.

This, however, is not the complete story. The continuation of any product on the list of certified dental materials is contingent on its maintenance at specification quality. Surveys of all products on the list are made by the American Dental Association Research Fellowship at the Council's direction. These surveys are made on samples procured on the open market. Whenever a material fails to comply with the specification requirements, it is removed from the list and the manufacturer is notified that his certification of the product is no longer acceptable. Thus, although the Council cannot test the entire production of dental materials, its certification plan calls for continuous testing by the manufacturer and check tests by the Fellowship so that a constantly high level of quality of the products on the list will be maintained. Revisions of the list appear in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION from time to time.

Lately there have appeared through the mail some advertisements for amalgam alloys, mercuries, zinc phosphate cements and acrylic resins with statements that the manufacturer guarantees them to comply with the specifications of the American Dental Association. An examination of the list of certified dental materials shows that some of the materials that have been so advertised have not been certified by their manufacturers to the Council on Dental Research. The certification program is financed jointly by federal and American Dental Association funds, and no charge whatsoever is made to the manufacturer. If a manu-

facturer is regularly testing his material, then the only expense he will have in certifying the material to the Council is the cost of the three cent stamp required for mailing the certificate and data. When a dentist sees a statement such as, "Every batch of this alloy is carefully tested before being released for shipment to be sure that it fully meets A.D.A. specifications," he should be certain to check the list of certified dental materials to see if the product appears there.

In the purchase of certified material for use in dental practice, this list should be used as a buyer's guide. In addition, the package of material received should be checked for its exact name as given in the list and for a statement thereon guaranteeing compliance with the specification. The Council should be notified of any discrepancies.

CERTIFIED AMALGAM ALLOYS (A.D.A. SPECIFICATION NO. 1)

Alloy	*Manufacturer or distributor*
Abner Fine Cut	Abner Alloys Co.
Accurate Metalloy (filings)	The L. D. Caulk Co.
Argentum "A" cut; fine cut; medium cut; shavings	Hammond Dental Mfg. Co.
Aristaloy	Baker & Co., Inc.
Banner (filings)	Goldsmith Bros. Smelting & Refining Co.
Baring (improved fine cut)	Baring Smelting & Refining Co.
Brewster Medium	Brewster Laboratories
Certified	Lee S. Smith & Son Mfg. Co.
Cresilver	Crescent Dental Mfg. Co.
Dee (filings)	Kerr Mfg. Co.
Excel	Daniels Dental Alloy Co.
Fellowship	Dental Protective Supply Co.
Filling alloy, fine grain	Abe Bass
Fleck's	Mizzy, Inc.
Garfield's	Garfield Smelting & Refining Co.
Gold Bond	Jefferson Dental Supply Co.
H & M Special	Hauser and Miller
Lustraloy Regular	Pfingst & Co.
Minimax (filings) 173; 177; 178; 178 fine cut; 183; White Gold & Platinum; (shavings) 177; 178	The Minimax Co.
Mission No. 5; No. 5 "A" Cut	Henry F. Bruce Co.
Modeloy (quick setting filings)	Crescent Dental Mfg. Co.
Mynol Improved	Mynol Chemical Co.
National Dental	Eskay Dental Products
New Deal	Miller Dental Co.
Oceanic Filling Alloy	Oceanic Chemical Co., Inc.
Odontographic "Improved" (filings)	Odontographic Mfg. Co.
Pearlol	Wildberg Bros. Smelting & Refining Co.
Peerless	Herbert D. Damsky
Precision	Precision Bur Co.
Research Oralloy	Precious Metals Research Works, Inc.
Royal Super First Setting	Garhart Dental Specialty Co.
Safco 69	Safco Laboratories
Silver Crown Fast; Medium; Slow; Non Zinc	General Refineries, Inc.
Silverloy (filings); F.C. #20 for Proportioner; (shavings)	Crescent Dental Mfg. Co.
Speyer	Speyer Smelting & Refining Co.
S-C Medium (filings)	Stratford-Cookson Co.
Standard	Standard Dental Products Co.
Stratco	Edward P. Stratt

Tri-Alloy	Tri-Boro Dental Supply Co., Inc.
True Dentalloy (filings); Cut "A"	The S. S. White Dental Mfg. Co.
Twentieth Century Regular; Special; Fine Cut; Non Zinc	The L. D. Caulk Co.
Ultra Brand	H. Jelinek
Vertex	Vertex Dental Products Co.
White Beauty	Lang Dental Mfg. Co.
Yates Balanced	J. Yates Dental Mfg. Co.

CERTIFIED INLAY CASTING INVESTMENTS (A.D.A. SPECIFICATION NO. 2)

Investment	*Manufacturer or distributor*
Baker Cristobalite	Baker & Co., Inc.
Beauty-Cast	Whip-Mix Corp., Inc.
Kerr Cristobalite-Inlay	Kerr Mfg. Co.
Ransom and Randolph Gray	The Ransom & Randolph Co.
Security Improved Inlay	The Cleveland Dental Mfg. Co.
Steele's-Super	The Ransom & Randolph Co.

CERTIFIED IMPRESSION COMPOUNDS (A.D.A. SPECIFICATION NO. 3)

Compound	*Type*	*Manufacturer or distributor*
Certified	I	Lee S. Smith & Son Mfg. Co.
Exact	I	The S. S. White Dental Mfg. Co.
Kerr Perfection; No. 2 Soft Green; Gray; White; Black	I	Kerr Mfg. Co.
Mizzy—Low Heat	I	Mizzy, Inc.
S. S. White—Black—Tray	II	The S. S. White Dental Mfg. Co.

CERTIFIED INLAY CASTING WAXES (A.D.A. SPECIFICATION NO. 4)

Wax	*Manufacturer or distributor*
Baker-Blue—regular medium	Baker & Co., Inc.
Caulk-Blue	The L. D. Caulk Co.
Kerr-Blue—Hard	Kerr Mfg. Co.
Security	The Cleveland Dental Mfg. Co.
Taggart's Blue	Mizzy, Inc.

CERTIFIED INLAY CASTING GOLD ALLOYS (A.D.A. SPECIFICATION NO. 5)

TYPE A, SOFT

Alloy	*Manufacturer or distributor*
Aderer-A-Soft	Julius Aderer, Inc.
Baker Inlay Soft	Baker & Co., Inc.
Bruce "A"	Henry F. Bruce Co.
Chilcast No. 1	Vernon-Benshoff Co.
Coe 1	Coe Laboratories, Inc.
Crown Inlay No. 2 Soft; K	General Refineries, Inc.
Deeone	Dee Division of Handy & Harman
GB Inlay No. 1 Soft	Goldsmith Bros. Smelting & Refining Co.
Jelenko Special Inlay	J. F. Jelenko & Co., Inc.
Krause Soft Inlay	Krause Gold Refinery

Leff Light Inlay	Benjamin R. Leff
Luft "A"	John Luft Prescription Alloys
Mowrey's S-1	W. E. Mowrey Co.
Ney-Oro A; AA	The J. M. Ney Co.
Noble No. 1	Noble Metals & Alloys Co.
Research A	Precious Metals Research Works, Inc.
Spyco Soft; Eleven	Spyco Smelting & Refining Co.
S. S. White No. 2; 900 Soft; 940 Very Soft	The S. S. White Dental Mfg. Co.
Stern S	I. Stern & Co., Inc.
Wildberg A-2	Wildberg Bros. Smelting & Refining Co.
Wilkinson 2S	Wilkinson Co.
Williams Inlay 3; Will-Cast 22	The Williams Gold Refining Co., Inc.

TYPE B, MEDIUM

Alloy	*Manufacturer or distributor*
Aderer-B-Medium	Julius Aderer, Inc.
Aleco No. 1; No. 2	A. L. Engelhardt Co.
Baker Inlay Medium	Baker & Co., Inc.
Bruce "O"	Henry F. Bruce Co.
Chilcast M; 1M; 2M	Vernon-Benshoff Co.
Coe 2	Coe Laboratories, Inc.
Crown Inlay No. 1 Hard; Knapp No. 2; T	General Refineries, Inc.
Deetwo	Dee Division of Handy & Harman
GB Inlay No. 2 Medium Hard	Goldsmith Bros. Smelting & Refining Co.
Jelenko Modulay; Platincast	J. F. Jelenko & Co., Inc.
Krause Hard Inlay	Krause Gold Refinery
Leff Medium Soft	Benjamin R. Leff
Luft "B"	John Luft Prescription Alloys
Mowrey's B-Inlay; S-2; No. 91	W. E. Mowrey Co.
Ney-Oro A-1; A-10	The J. M. Ney Co.
Noble No. 2	Noble Metals & Alloys Co.
Spyco Inlay; Medium, Tinker one	Spyco Smelting & Refining Co.
S. S. White No. 1; No. 5; No. 820	The S. S. White Dental Mfg. Co.
Stern 1; No. 3290	I. Stern & Co., Inc.
Wildberg "A"; C-2	Wildberg Bros. Smelting & Refining Co.
Wilkinson 8M	Wilkinson Co.
Williams Pioneer; Special Inlay; One "Inlay"	The Williams Gold Refining Co., Inc.

TYPE C, HARD

Alloy	*Manufacturer or distributor*
Aderer-C-Hard; "Dressel"	Julius Aderer, Inc.
Aleco No. 4	A. L. Engelhardt Co.
Baker Hard Inlay	Baker & Co., Inc.
Bruce No. 5	Henry F. Bruce Co.
Chilcast No. 2; No. 2-H	Vernon-Benshoff Co.
Coe 3	Coe Laboratories, Inc.
Crown No. 9; Knapp No. 3; Supreme Inlay; TT	General Refineries, Inc.
Deesix	Dee Division of Handy & Harman
GB Inlay No. 3 Hard	Goldsmith Bros. Smelting & Refining Co.
Jelenko Durocast; Firmilay	J. F. Jelenko & Co., Inc.
Leff C	Benjamin R. Leff
Luft "C"	John Luft Prescription Alloys
Mowrey's S-3; Special; No. 120	W. E. Mowrey Co.

Ney-Oro B; B-2; BW	The J. M. Ney Co.
Noble No. 3	Noble Metals & Alloys Co.
Research No. 5; "Inlay"	Precious Metals Research Works, Inc.
Spyco No. One-H; Six; Tinker Two; Hard	Spyco Smelting & Refining Co.
S. S. White No. 8; No. 13; 860 Hard	The S. S. White Dental Mfg. Co.
Stern 2; 3337; 3465; H	I. Stern & Co., Inc.
Wildberg "C"; B	Wildberg Bros. Smelting & Refining Co.
Williams Klondiker; Special "Four"	The Williams Gold Refining Co., Inc.

CERTIFIED DENTAL MERCURIES (A.D.A. SPECIFICATION NO. 6)

Mercury	*Manufacturer or distributor*
Argentum	Hammond Dental Mfg. Co.
Ballard's	Quicksilver Producers Association
Certified	Lee S. Smith & Son Mfg. Co.
Chemically Pure	The S. S. White Dental Mfg. Co.
C. P. Mercury	Goldsmith Bros. Smelting & Refining Co.
Crown	General Refineries, Inc.
Dee Brilliant	Kerr Mfg. Co.
Dental	Drug Laboratories, Inc.
Dental, C. P.	F. W. Berk & Co., Inc.
Fellowship	Dental Protective Supply Co.
Garfield's	Garfield Smelting & Refining Co.
Garhart's Positively Pure	Garhart Dental Specialty Co.
Krause's Pure	Krause Gold Refineries
Mercury C. P.	Metalsalts Corp.
Mercury C. P.	Wildberg Bros. Smelting & Refining Co.
Mercury N. F. IX Redistilled	Mallinckrodt Chemical Works
Minimax	The Minimax Co.
Mission	Henry F. Bruce Co.
Mynol	Mynol Chemical Co.
Ney	The J. M. Ney Co.
Odontographic	Odontographic Mfg. Co.
Research	Precious Metals Research Works, Inc.
Spectropure	Baker & Co., Inc.
Spyco	Spyco Smelting & Refining Co.
Twentieth Century	The L. D. Caulk Co.
Williams	The Williams Gold Refining Co., Inc. (Applies to Williams' one pound bottles only, as quarter pound containers are not glass.)

CERTIFIED WROUGHT GOLD WIRE ALLOYS (A.D.A. SPECIFICATION NO. 7)

Alloy	*Manufacturer or distributor*
Aderer No. 1; No. 3; No. 4; No. 20 Clasp	Julius Aderer, Inc.
Baker Q. A.	Baker & Co., Inc.
Crown Hylastic	General Refineries, Inc.
Deepep-Hard	Dee Division of Handy & Harman
GB Extra High Fusing; Medium Fusing; Regular High Fusing	Goldsmith Bros. Smelting & Refining Co.
Jelenko No. 3 Wire; Super Wire	J. F. Jelenko & Co., Inc.
Ney-Oro Elastic No. 4	The J. M. Ney Co.
Spyco No. 2; No. 4	Spyco Smelting & Refining Co.
S. S. White No. 12; No. 61 Metalba	The S. S. White Dental Mfg. Co.
Stern No. 2657	I. Stern and Co., Inc.
Vernon-Benshoff Clasp Wire No. 6	Vernon-Benshoff Co.
Williams No. 1 Super; No. 2 High Fusing Clasp; No. 3 High Tensile	The Williams Gold Refining Co., Inc.

CERTIFIED ZINC PHOSPHATE CEMENTS (A.D.A. SPECIFICATION NO. 8, FIRST REVISION)

Cement	*Manufacturer or distributor*
Ames Z-M	The W. V-B Ames Co.
Bosworth's Zinc	Harry J. Bosworth Co.
Caulk Crown and Bridge; Petroid Improved; Tenacin	The L. D. Caulk Co.
Certicem	Lee S. Smith & Son Mfg. Co.
Fleck's Extraordinary	Mizzy, Inc.
Lang Crown Bridge and Inlay	Lang Dental Mfg. Co.
S-C	Stratford-Cookson Co.
Smith's	Lee S. Smith & Son Mfg. Co.
S. S. White Silver Improved; Zinc; Zinc Improved	The S. S. White Dental Mfg. Co.

CERTIFIED SILICATE CEMENTS (A.D.A. SPECIFICATION NO. 9)

Cement	*Manufacturer or distributor*
Ames Plastic Porcelain	The W. V-B Ames Co.
Astralit	Premier Dental Products Co.
Baker Plastic Porcelain	Baker & Co., Inc.
Diafil	Pfingst & Co., Inc.
DeTrey's Synthetic Porcelain; Syntrex	The L. D. Caulk Co.
Durodent Enamel	Oskar Schaefer
Smith's Certified Enamel Improved	Lee S. Smith & Son Mfg. Co.
S. S. White Filling Porcelain Improved	The S. S. White Dental Mfg. Co.

CERTIFIED HYDROCOLLOIDAL IMPRESSION MATERIALS—AGAR TYPE (A.D.A. SPECIFICATION NO. 11)

Material	*Manufacturer or distributor*
Coe-Loid 66	Coe Laboratories, Inc.
Deelastic	Kerr Mfg. Co.
Dentocoll	The L. D. Caulk Co.
Elastic Colloid	The S. S. White Dental Mfg. Co.
Kerr Hydro-Colloid	Kerr Mfg. Co.
Perfectocoll	Baker & Co., Inc.
Plasticoll	Lee S. Smith & Son Mfg. Co.
Surgident	Surgident, Ltd.

CERTIFIED DENTURE RESINS (A.D.A. SPECIFICATION NO. 12)

Material	*Form*	*Manufacturer or distributor*
Acralite	Clear; pink; powder-liquid	Acralite Co., Inc.
Ac-Ril	Pink; powder-liquid	Ac-Ril Dental Corporation
Acri-Lux	Pink; powder-liquid	Acri-Lux Dental Mfg. Co.
Acrylic A Pink	Pink; powder-liquid	Austenal Laboratories, Inc.
Acrylic A Mottled	Pink; powder-liquid	
Acrylic A Orange Pink	Pink; powder-liquid	
B-B	Clear; pink; powder-liquid	Bell Dental Products Co.
Certified	Clear; pink; powder-liquid	Lee S. Smith & Son Mfg. Co.
Coe Acrylic	Pink; powder-liquid	Coe Laboratories, Inc.
Coralite	Pink; powder-liquid	Coralite Dental Products Co.

Crystolex, Regular	Pink; powder-liquid	Kerr Mfg. Co.
Crystolex, Form 102	Pink; powder-liquid	
Densene 33	Clear; pink; powder-liquid	Cosmos Dental Products Co.
Denture Acrylic	Clear; pink; powder-liquid	The S. S. White Dental Mfg. Co.
Enciton	Pink; powder-liquid	The L. D. Caulk Co.
Hygienic	Pink; powder-liquid	The Hygienic Dental Mfg. Co.
Improved Justi-Tone	Pink; powder-liquid	H. D. Justi & Son, Inc.
T-3; Justi-Tone	Pink; powder-liquid	
Jectron	Pink; precured blank	Toledo Dental Products Co.
Lang's	Pink; powder-liquid	Lang Dental Mfg. Co.
Loktone	Clear; pink; powder-liquid	Myerson Tooth Corporation
Lucitone	Clear; pink; plastic cake Clear; pink; powder-liquid	The L. D. Caulk Co.
Luxene 44	Pink; plastic cake	Luxene, Inc.
Marvel	Pink; powder-liquid	Marvel Dental Products Co.
Miracryl	Pink; powder-liquid	The Motloid Co., Inc.
Opalex "45"	Pink; powder-liquid	The Opalex Co.
Oryl Brand	Pink; powder-liquid	The Wm. Getz Corporation
Palatex	Pink; powder-liquid	Rockland Dental Co., Inc.
Perma Cryl	Pink; powder-liquid	Acri-Lux Dental Mfg. Co.
Premier	Clear; pink; powder-liquid	Premier Dental Products Co.
Q. E. D.	Pink; powder-liquid	H. D. Justi & Son, Inc.
Standard Brand	Pink; powder-liquid	Ray Foster Dental Supplies
Vernonite	Clear; pink; plastic cake Pink; powder-liquid	Vernon-Benshoff Co.
Vitacrilic D. L.	Pink; powder-liquid	Fricke Dental Mfg. Co.
Vita-Lite	Clear; pink; powder-liquid	Vita-Lite Products Co.
Vitalon	Pink; powder-liquid	Austenal Laboratories, Inc.

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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Editorials

One hundred years of Association history

A history of the American Dental Association was authorized at the Cleveland meeting by the Board of Trustees as a feature of the centenary celebration in 1959.[1] The Board has voted funds to finance the research and writing of such a history, which will be undertaken by a competent professional historian on the staff of a Midwestern university. The collection of material and preparation of the text of the history, it is expected, will take three years. The finished manuscript, it is contemplated, will make a printed volume of about three hundred pages.

For many reasons, this project is a notable undertaking. A complete history of the Association has never before been written. The hundredth anniversary of the inception of the Association is an auspicious occasion for such a record. The century-long existence of the Association, from its origin to the present, furnishes many interesting developments and events. The phenomenal growth of the membership has been unapproached by any similar professional organization. The Association's accomplishments reflect the work of many of the most distinguished dentists whose efforts for the common good of the profession are at once intriguing and inspiring. There is also to be narrated the rise of the various problems which the Association has wrestled with and, for the most part, solved to the benefit of the profession.

The Association originated from a struggle between conflicting theories of professional organization. The present American Dental Association represents a third attempt to establish a satisfactory and permanent society. In 1840 the first organization claiming to be national in scope was established as an autocratic closed corporation of small and select membership. When its unyielding bigotry brought about the dissolution of the society in 1856, the pendulum swung far to the left, and a new association, the Dental Convention, was inaugurated with little or no qualification requirement for membership and only the loosest organization. Finding unsatisfac-

tory both of these previous attempts at bringing together the profession in a union, farsighted leaders, in 1859, conceived the idea of a delegated organization, which became the American Dental Association and in which the basic idea of representation has been preserved to the present day.

The proposed history will doubtless provide an authentic and full account of many important phases of the Association's progress, of which the dental historian, in his present unenlightenment, can give only an uncertain and sketchy account. Every dentist who recognizes the importance of his Association will await this opportunity to acquaint himself with its history.

1. See News of Dentistry, this issue.

Dental health begins at the community level

Despite the golden promises of dentifrice manufacturers, the most effective method of improving dental health in a community still lies in dental health education. That dentists in Rochester, New York, are fully aware of this fact is evidenced by a report of a two-day conference on dental health education held in their city early last month. The conference, which was conducted by the Rochester Dental Society under the sponsorship of the Seventh District Dental Society of that state, was reported to be the first local working conference of its kind ever to be held in New York. Judged by its program and the conclusions reached by its participants, the Rochester workshop might well serve as a pattern for other component societies.

One of the principal objectives of the Council on Dental Health, when organized by the Association in 1942, was to encourage the establishment of state and local councils on dental health, and it was visualized that one of the principal duties of those councils would be to conduct conferences on dental health in which representatives of other health, education, civic and welfare groups—key people in the community—could participate and assist in solving local dental health problems.

Annually, since its inception, the Council on Dental Health of the Association has conducted one or more productive dental health conferences on a national level. During the past seven years, seventeen state dental societies have held a total of thirty such conferences on the state level. Although the national and state conferences have been successful within the boundaries of their influence, they have not reached down into the homes and hearts of the community leaders as effectively as would conferences on the grass root level. What dentistry—particularly public health dentistry—needs most at the moment is more and better local conferences at which the dental health problems of the community can be laid bare and analyzed and at which solutions can be initiated.

W. Philip Phair, secretary of the Council on Dental Health of the Association, sums up the situation succinctly in the following words: "The dental profession has been commended for its enlightened policies and the principles it has enunciated for programs to improve the dental health of the public—policies and principles that have been developed at the state and national levels. Unfortunately, an incomplete understanding on the part of dentists and citizens alike of what these principles mean in terms of actually doing something about dental health in the 40,000 com-

munities of the United States is hindering the achievement of worth-while and attainable goals."

The impact that could be made on dental disease if each of the 440 component societies of the Association would conduct annual dynamic, intelligent dental health conferences staggers the imagination. The Rochester Dental Society is to be commended for its initiative, but Rochester has no patent on the program. Other component dental societies seriously concerned about their community dental health problems will do well to write Rochester for its prescription. Or, if fearful of overloading the secretary of the Rochester Dental Society, they may write the Council on Dental Health of the Association. Each new and successful community dental health conference is another blow at dental disease.

Cancel life-long liability for teeth—new VA ruling to allow only justified service

Hard on the heels of a resolution passed by the House of Delegates of the Association last September to request the Veterans Administration to revise tests for determining the eligibility of veterans for dental service, the VA revamped its regulations on outpatient dental care. The new regulations, reported on page 607 of the November issue of THE JOURNAL, define seven classes of eligible veterans and list the benefits accruing to each. Under the new regulations veterans, with few exceptions, will be entitled to but one episode of treatment for service-connected dental conditions, and the federal government no longer will be liable for the lifetime care of defects incurred while in service.

Tightening restrictions further, the Veterans Administration announced on the fifth of November that veterans seeking hospital treatment for nonservice-connected ailments will be required to answer the following five questions concerning their financial status: current value of real and personal property; total of liquid assets; encumbrances on real property; average monthly expenditures, and average monthly income for the past six months. In the future as in the past, however, the veteran's signature will be regarded by the Veterans Administration as legal evidence of eligibility for hospitalization. Nevertheless, the veteran henceforth must look to his economic status more carefully than formerly before seeking medical care as a perquisite of former military service.

Although the November ruling requiring the financial screening of applicants for hospitalization has but an indirect bearing on the October ruling affecting applicants for VA outpatient dental service, it is indicative of a new pattern in federal philosophy and thoroughly in keeping with the latest regulations governing eligibility of veterans for dental care.

Regulations, however, are no better than their administration. Members of the dental profession join with other conscientious citizens in hoping that the administration of these latest VA rulings will deny to no veteran deserved health services and permit none to profit from services unmerited.

Dentistry Behind the Iron Curtain

The following account of dentistry in countries behind the Iron Curtain was prepared especially for THE JOURNAL by the Crusade for Freedom. Material contained herein has been taken from the files of the Crusade, the agency which supplies funds for the operation of Radio Free Europe. Information has been obtained through interviews with refugees from Communist-dominated Europe who have crossed over to the West.

The "Stakhanov" or Soviet speed-up, piecework system has invaded the dentist's office behind the Iron Curtain, resulting in shoddy treatment and lower health standards for the millions suffering under Communism.

The dentist has been mobilized and nationalized by the puppet regimes of Central and Eastern Europe. The result: victimization, not only of the dentists, but of the general public as well.

In April 1952, all dentists' licenses were revoked in Communist-controlled Bulgaria. Vulko Chervenkov's puppet regime stated that dentists might reapply for permission to practice at the discretion of the Party-dominated physicians' organization.

In order that the "medical worker" might concentrate on his "social duties," the Communist regime in Bulgaria further issued rules denying him the right to private practice. All dentists under 60 years of age were compelled to hold state jobs; those who refused faced permanent loss of their licenses within three months.

Very few refused, for refusal meant unemployment, starvation and possible imprisonment. Some who refused were sent to prison or forced labor camps, charged with "reactionary behavior"—Soviet Russia's new name for man's desire for a practice of his own.

In Czechoslovakia, the puppet government decreed two years ago that physicians and dentists must practice where they are told and that regional Party offices shall decide where that is to be. The decree also stated that physicians and dentists shall work mainly in public institutions.

The Czechoslovak government stated: "The new distribution of medical men (including dentists) will mean in practice considerably better health care in districts where during 'free' choice of practice, doctors did not settle for fear of low incomes."

Yet, under Communist rule, the people have been receiving steadily deteriorating dental care. Dentists are enormously overworked and must cope with a shortage of materials which makes their work almost impossible. They, just as factory workers, have their work "norms" to meet. In Czechoslovakia, they are expected to treat four and a half patients an hour. Yet the shortage of dentists and the overcrowded waiting rooms compel them to "exceed their norm" and many have to deal with six or even more patients an hour. They have been promised special bonuses for this extra work, but as far as the Crusade has learned, they have received none. The speed-up to which they and their patients are subjected has brought hasty and substandard work in its wake.

Much of the blame for the shoddy work rests with the shortage of materials. Mobilizing the entire Soviet orbit for heavy military production, the Kremlin permits few consumer goods to be produced. Recent promises by the new Malenkov regime that this situation will be remedied are looked on with great skepticism.

An escaped Bulgarian dentist generally treated 20 or more patients a day. "All dental work," he said, "is shoddy in Bulgaria today. Gold crowns are impossible to obtain; only porcelain is available. Very often we were faced with a shortage of the most basic needs —cotton, alcohol, plaster and other materials."

When this happens, the patient is simply told to go home and come back in a few weeks, when a particular type of supplies may be available. All dental materials come from a central state office and dentists make monthly requests for supplies. These, however, are rarely filled in full because of the general shortages that persist. Consequently, a rush to the dental waiting rooms during those days of the month which follow every new shipment is not unusual.

Dentists occasionally make a gold crown for a friend—if he can bring along his own gold. This work must, however, be done with the greatest secrecy, for both patient and dentist could be denounced for trafficking in the illegal gold market and for engaging in illegal private enterprise. Such gold crowns are placed only in the back of the mouth, where they cannot be seen easily.

The arbitrary means with which the Communists judge the patient's need for treatment

is strikingly illustrated in the case of Hungarian Army medical and dental care.

Unless the soldier can prove that his dental defect is a service-incurred disability, he must pay for dental work done while he is in service, for there are no regular dental clinics available to the troops. Most army dental work is done by civilian dentists; army dentists only prepare bridges when the service disability results in a 20 per cent loss of the soldier's ability to chew.

The situation which Hungarian civilians face is not much better. Although a number of dental clinics have been set up in the larger cities and in factories employing more than 1,500 workers, their work is largely limited to extractions and occasional dentures. In the Hungarian countryside, dental care in small towns and villages is limited to extractions and occasional rudimentary preventive measures.

Much the same state holds true for Communist-dominated Poland, the Crusade states. Patients are forced to wait from six to twelve months for artificial dentures, and the fit is generally poor. Those patients demanding a good fit must wait another three months.

Many Romanian dentists, in search of materials with which to treat their patients, have had to go to the black market for them. One dentist who fled to the West says that he bought the bismuth he needed from workers in ammunition factories—despite the death penalty imposed by the regime for those caught buying or selling the material. He also bought tin from workers at a Bucharest factory.

Such purchases were necessary because previously-imported Czechoslovakian materials were discontinued and Soviet Russian supplies were brought into Romania. These were of such low quality, says the dentist, that they almost always brought complaints. Even Russian officers stationed in Bucharest wanted none of their own country's products. The Russian-made filling material would crumble after a short while and often cause severe pain.

Dentists who continue to care for the welfare of the people coming to them prefer to risk buying their materials on the black market in order to make their own dentures and fillings.

This same Romanian dentist says that he knows of a 60-year-old practitioner who was sentenced to 25 years imprisonment and who subsequently died in jail because he had made a gold crown for a patient. The Soviet-dominated regimes of Central and Eastern Europe hope eventually to get rid of dentists of this age bracket. New dentists are being educated in Communist universities where they are given speeded-up courses much shorter than regular dental training. These, the Reds hope, will form a group of dental practitioners uninfected by the "virus of bourgeois capitalism."

Notable among the efforts which the Free World is expending to counteract Communist measures is the Crusade for Freedom itself. Through Radio Free Europe, it beams continuous messages of hope, encouragement and information to the 70,000,000 captive peoples living in Poland, Czechoslovakia, Hungary, Romania, Bulgaria and Albania.

In the belief that strengthening the captive peoples' will to resist Soviet blandishments and maintaining their love of liberty furthers the cause of world peace and freedom, the Crusade for Freedom directs its hard-hitting broadcasts into Central and Eastern Europe over 21 powerful medium and short wave radio transmitters. Uniquely effective because of its private character, Radio Free Europe has been made possible by the contributions of millions of Americans to the Crusade for Freedom.

Radio Free Europe numbers among its broadcasts a regular commentary for physicians and dentists in Soviet-occupied Europe. Entitled "The Doctors Talk It Over," the program keeps physicians and dentists in Central and Eastern Europe informed of new professional developments in the West. It not only informs them of new drugs and technics, latest discoveries and conclusions, but also discusses with them their own problems—familiar to the Crusade through its extensive information network.

Here, as in every broadcast, Radio Free Europe's main effort is to keep the peoples of this crucial area allied to the West in spirit, to sustain their attachment to the principles of Western democratic procedures and to assist them in their daily struggle against the total terror of world Communism.

Washington News Letter

With the convening of Congress still several weeks distant, Washington already is an anthill of activity in which numerous legislative bills are being rounded out and polished up for early introduction.

The Department of Defense is expected to sponsor measures providing for dental and medical school scholarships and placing on an orderly, systematic basis the provision of health benefits for dependents of military personnel.

Public hearings conducted in November by the Curtis subcommittee of the House Ways and Means Committee have paved the way for consideration by the parent committee of proposed Social Security revision. One aspect of this revision would be coverage of all self-employed dentists (those on salaries already are blanketed in by existing law).

Scheduled to return to Washington early in December are three members of the House Interstate and Foreign Commerce Committee, who have spent the past month in Europe examining nationalized health services. Prior to his departure, Chairman Charles A. Wolverton (Rep., N. J.) strongly intimated that the committee will recommend some plan of federal participation in voluntary prepayment plans.

From the standpoint of veterans' health care and hospitalization, there is little doubt that major reforms in this field will be demanded on Capitol Hill.

The initiation in October of single-treatment outpatient dental care by the Veterans Administration brought about such a volume of protests within six weeks after it was introduced that chances were heightened for liberalizing legislation that would require the VA to provide continuing care for all service-connected dental disabilities.

In the more distant future are prospects of legislative reforms to be recommended by two study groups set up by Congress—the Hoover Commission on reorganization of the executive establishment and the Commission on Intergovernmental Relations. Their findings and proposals are certain to exert a strong influence on the administration and policies of the government's huge medical household and relations with state and local governments in matters concerning grants-in-aid for support of professional dental education, dental research and dental public health.

Within the past few weeks the Hoover Commission has appointed a medical advisory group. Its chairman, a layman, is Chauncey McCormick, a Chicago business man. The one dental member is Otto W. Brandhorst of St. Louis, past president of A.D.A. All of the other appointees, numbering 13, are physicians.

Another important recent development is the selection of Frank Brown Berry of New York to succeed Melvin A. Casberg as Assistant Secretary of Defense for health and medical affairs. Despite strong urging by Secretary Charles E. Wilson to remain, Dr. Casberg told friends several months ago he planned to leave the government at the end of this year to return to private practice of surgery in California.

Dr. Berry in November assumed part time duties at the Pentagon in the capacity of consultant. His nomination as Assistant Secretary is to be sent to the Senate by President Eisenhower in January. He will resign his position as clinical professor of surgery in the College of Physicians and Surgeons, Columbia University.

Support of fluoridation was reaffirmed by the Association of State and Territorial Health Officers at its annual November conference with U.S. Public Health Service officials and state hospital and mental health authorities.

"Some State Dental Directors are having trouble," the Association stated, "in showing the values of fluoridation in some communities. This 'resistance' is coming from many sources, such as civic leaders, municipal leaders, engineers and some religious groups. New educational materials such as pamphlets, posters and films are urgently needed.

"The present supply from both the Public Health Service and the American Dental Association has been very widely distributed. New literature will give additional force in helping many communities and organizations endorse fluoridation as an immediate project for their community. Also, further statistics from all controlled studies now in progress throughout the entire world would be of great value."

ARMED FORCES PROCUREMENT

Up-to-date information on dental procurement for the Armed Forces was presented to the

Association of Military Surgeons at its annual meeting in Washington November 11. The statistical picture was given by Howard A. Rusk, chairman of the National Advisory Committee to Selective Service and of the Health Resources Advisory Committee (Office of Defense Mobilization). Among highlights of his remarks were:

Under provisions of the so-called doctor draft law since its inception in September 1950, well over 5,000 dentists have been called to active duty. These include more than 3,000 in Priority I, or 75 per cent of the special registrants; about 500, or 60 per cent, of the Priority II's, and 1,750 (12 per cent) in Priority III.

Dentists face a severe callup program in 1954, Dr. Rusk warned. It will be necessary to place approximately 5,600 on active duty in the next 18 months. Even if the reservoirs of Priority I and Priority II are exhausted, along with the estimated 2,600 younger dentists (under 30) in Priority III, it still will be necessary to take about 1,000 dentists in the over-30 group and some who are 40 and older, he stated.

"In terms of the potential needs of the services," said Dr. Rusk, "the present dental military standard of 1 to 500 is probably not excessive, in view of the cumulated dental neglect to be found in the mouth of the average draftee, and the biennial turnover of young men in military service.

"In terms of the available supply of dentists, however, the military utilization rate is extremely high. In relation to supply, the military services make much more liberal use of dentists than of physicians or nurses. The military services have proportionately almost four times as many dentists as does the civilian population, in contrast to not quite three times as many physicians and one and a half times as many nurses."

Association Affairs

HISTORY OF THE ASSOCIATION TO BE WRITTEN

In accordance with the authorization of the Board of Trustees, the Association has contracted with Loyola University of Chicago for the writing of *A History of the American Dental Association*, to be issued in observance of the centennial year of 1959.

Paul McCluggage of Chicago, who has earned his Ph.D. degree in history and who is now on the faculty of the University, will conduct the research and write the manuscript for the book. He will work under the direction of a committee to be composed of two representatives of the Association, Lon W. Morrey and George B. Denton of Chicago, and one representative of the University, Paul Lietz, chairman of the department of history.

The manuscript is to be furnished the Association not later than December 31, 1956. Arrangements have not been made as yet for its publication.

CHARLES H. PATTON TO SERVE AS THIRD DISTRICT TRUSTEE

Charles H. Patton, orthodontist of Philadelphia and past president of the Pennsylvania State Dental Association, has been appointed to the American Dental Association's Board of Trustees to succeed the late W. Earle Craig.

Dr. Patton, who will represent the Third District, was appointed October 26 by Leslie M. FitzGerald, Association president. Dr. Patton will serve until the 1954 annual session, at which time the House of Delegates will elect a trustee for the remainder of the unexpired term ending in 1956.

A graduate of the University of Pennsylvania in 1916, Dr. Patton has been a member of the Council on Scientific Session and has held the presidency of the

C. H. Patton

Academy of Stomatology, the Pennsylvania Association of Dental Surgeons, Philadelphia County Dental Society and the alumni organization of the University of Pennsylvania.

During the recent annual session, Dr. Patton represented the Third District at meetings of the Board of Trustees in the absence of Dr. Craig, who was unable to attend because of illness.

CONFERENCE OFFERS RULES ON CLINICAL STUDIES OF CARIES

Seven committee reports, composed by 25 dental scientists, were presented, altered in varying ways and approved by the November 2-3 conference to develop uniform standards and procedures in clinical studies of dental caries.

The seven committees, appointed several months ago, presented formal statements which contained the recommendations they had arrived at in preconference deliberations on the following

aspects of clinical studies: type of index of caries experience, standardization of dental examinations, methods for the control of variables, the use of laboratory tests in a clinical study, conduct of the investigation, analysis of data and evaluation of the results and principles of publication.

The uniform standards which were approved by the conference have been sought in order to help investigators to achieve accuracy and to make it possible for Association agencies to evaluate the effectiveness of new products and procedures used in the investigations.

The conference was sponsored by the Council on Dental Health, Council on Dental Research and the Council on Dental Therapeutics.

The final reports, written by Conference reference committees and approved by the full conference, will be published in THE JOURNAL.

REPORT FIRST CONTRIBUTIONS TO RELIEF FUND DRIVE

Contributions to the 1953-54 Relief Fund campaign of the American Dental Association which opened in October totaled $46,799.66 at the end of the first reporting period, November 14.

A goal of $100,000 has been set for this year's drive; last year contributions reached $103,461.89. Contributions this year will be reported in two separate lists: those from state societies with goals over $900 and those from societies with goals of $900 or less.

Goals for this year and total contributions for last year are listed below:

Quota Over $900.00

	1953-54 Quota	1952-53 Contributions	1952-53 Pct.
California	$ 3,740.00	$ 3,723.50	102.9
So. California	4,530.00	8,217.00	184.3
Colorado	920.00	991.00	103.2
Connecticut	1,930.00	1,889.00	96.9
Florida	1,270.00	1,495.00	122.5
Georgia	1,040.00	1,122.00	104.9
Illinois	7,370.00	7,661.50	101.2
Indiana	2,350.00	2,536.00	113.2
Iowa	1,860.00	1,594.00	84.8
Kansas	990.00	990.01	100.0
Kentucky	1,120.00	1,459.50	135.1
Louisiana	1,010.00	1,114.60	112.6
Maryland	1,060.00	1,071.00	99.2
Massachusetts	3,780.00	3,739.67	98.2
Michigan	4,010.00	4,162.65	104.3
Minnesota	2,940.00	2,773.50	93.4
Missouri	2,530.00	2,627.00	101.4
Nebraska	1,060.00	1,125.50	103.3
New Jersey	4,070.00	5,098.60	123.2
New York	15,210.00	11,998.50	78.8
North Carolina	1,230.00	1,478.25	119.2
Ohio	4,980.00	4,825.30	97.1
Oregon	1,200.00	1,301.00	110.3
Pennsylvania	6,830.00	5,443.44	78.1
Tennessee	1,200.00	1,711.50	148.8
Texas	3,160.00	2,168.50	71.1
Virginia	1,130.00	1,033.50	90.7
Washington	1,780.00	2,082.00	117.0
Wisconsin	2,910.00	2,533.00	86.5
Total	$ 87,210.00	$87,966.92	100.9

Quota of $900.00 or less

	1953-54 Quota	1952-53 Contributions	1952-53 Pct.
Air Force	$ 600.00	$ 528.50	94.4
Alabama	750.00	2,011.39	261.2
Alaska	50.00	155.00	310.0
Arizona	280.00	504.00	186.7
Arkansas	560.00	639.65	120.7
Army	630.00	436.22	80.8
Delaware	160.00	153.00	102.0
Dist. of Col.	850.00	1,398.00	162.6
Hawaii	360.00	470.00	127.0
Idaho	260.00	516.00	198.5
Maine	450.00	358.25	79.6
Mississippi	520.00	546.20	105.0
Montana	370.00	507.50	133.6
Navy	830.00	517.50	65.5
Nevada	90.00	108.50	108.5
N. Hampshire	290.00	342.50	118.1
New Mexico	250.00	272.50	123.9
North Dakota	340.00	477.55	136.4
Oklahoma	890.00	1,305.00	145.0
P. Canal Zone	20.00	7.00	23.3
P. Health Serv.	260.00	157.00	58.1
Puerto Rico	190.00	144.59	76.1
Rhode Island	580.00	375.00	65.8
So. Carolina	410.00	342.00	85.5
South Dakota	340.00	376.00	110.6
Utah	450.00	437.50	91.1
Vermont	190.00	157.50	82.9
Vet. Admin.	900.00	404.00	42.1
W. Virginia	740.00	810.50	112.6
Wyoming	180.00	180.50	112.8
Total	$ 12,790.00	$14,638.85	114.5

NEW CHAIRMAN, MEMBER NAMED TO COUNCIL

Charles S. Kurz of Carlyle, Ill., has been appointed chairman of the Council on Scientific Session, and David J. Fitzgibbon of Washington, D. C., has been appointed to membership on the Council, it has been announced by Leslie M. FitzGerald, president of the Association.

Dr. Kurz has been a member of the Council since 1951; as chairman he replaces Charles H. Patton of Philadelphia, who has accepted the trusteeship of the Third District, succeeding the late W. Earle Craig.

STATE SECRETARIES' MEETING DRAWS 26 SOCIETY EXECUTIVES

Representatives from 19 constituent dental societies participated in the Sixth State Secretaries' Management Conference November 16-18 in the Central Office of the Association.

Discussions on committee structure, use and function of committees and committee operation composed the program of the first day. Panelists included Bernard J. Conway, secretary of the Council on Dental Trade and Laboratory Relations and of the Council on Federal Dental Services; Alice F. Sturgis, consultant on parliamentary procedure; James Robinson of Southern California; John G. Carr of New Jersey; Paul W. Clopper of Illinois; Wayne L. McCulley of Tennessee; E. E. Ewbank of Indiana and A. B. Coxwell of Kentucky.

Other sessions concerned the finances, investments and insurance program of a state dental society. Louis M. Cruttenden, assistant secretary of the Association, and Willard H. Hurley of Oregon spoke on finances; Richard H. Samuels spoke on investments, and John G. Rooks of California and Harold E. Tingley of Massachusetts spoke on insurance.

Other participants who addressed the Conference included John Owens of Dublin; William VonderLehr of the Loyola University Student Dental Association; Ray Cobaugh of Pennsylvania; Carl V. E. Cassel of Minnesota and H. Leon Snow of Michigan.

SENIOR PAST PRESIDENT HOMER C. BROWN DIES

Homer C. Brown of Columbus, Ohio, a leader of the dental profession since the turn of the century and senior past president of the American Dental Association, died November 7 at the age of 84.

Secretary of the committee which reorganized the National Dental Association (later renamed American Dental Association) in 1913, Dr. Brown was elected president of the Association in that same year. On the completion of his term he was elected chairman of the Legislative Committee, an office he held for 21 years. During those years, the Committee was credited with keeping tariff on dental instruments at a lower rate than tariff on surgical instruments,

H. C. Brown

and with obtaining military service regulations authorizing promotions for dental corps officers equal to those of medical corps officers.

In other Association activities he was a member of the committee which developed the Cooperative Research Program in the National Bureau of Standards and chairman of the committee which developed the program which

The poster heralding the sixth annual observance of National Children's Dental Health Day, to be held February 1, headlines the advice, "Brush your teeth right after you eat!" The poster is being shipped to dental societies in requested numbers for distribution before the event. Packets of publicity and promotional material also are being sent to local chairmen by the Association's Bureau of Public Information.

was the forerunner of the Council on Dental Therapeutics.

Dr. Brown was graduated in 1890 from the Ohio College of Dental Surgery at Cincinnati, and opened his practice immediately in Gallipolis, Ohio. He practiced in Columbus during 1902-1936. In 1907 he was president of the Ohio State Dental Society, and in 1913 he became the first dentist to be appointed to a State Board of Health. He served as a government delegate to the International Dental Congresses in London in 1914 and in Paris in 1931.

OTHER HIGHLIGHTS OF THE 94TH ANNUAL SESSION

Because of lack of space, the following highlights of the 94th annual session of the Association were omitted from the November issue of THE JOURNAL:

PRESIDENT'S REPORT

The dental profession must plan methods of meeting the cost of dental education and the demand for expanded dental services, asserted Otto W. Brandhorst of St. Louis, retiring president of the Association, in his report to the House of Delegates at its first session September 28.

"I am sure that you will agree with me in regard to the importance of dental education; it is the foundation of the profession, without which it ceases to exist," Dr. Brandhorst said. "Upon the proper training of the dental student depends our future status. Yet the records show that our educational program is not self-supporting and it, therefore, becomes our number one problem."

The plan submitted by Dr. Brandhorst would require state and local studies "to determine the needs and the demand in each state, as well as area in the state." These studies would necessarily give consideration to the future effects of preventive programs, increase in population, more effective use of auxiliary personnel and equipment and annual loss of professional personnel through death and retirement.

"These studies having been made, it should be relatively easy for each state to determine, year by year, the approximate number of dentists that should be brought into each state, Dr. Brandhorst added.

Dental schools would then be paid by individual states approximately $1,500 annually for the education of each dental student who would practice in the sponsoring state. This subsidy, plus the tuition of the students themselves, would make up the deficit presently being experienced by dental schools.

"It seems only right," he commented, "that the states benefiting from the services of those trained persons contribute to the cost of their education."

Expanded Dental Services • "The need for providing ways and means of extending health services to all who seek them" was termed another vital need.

Local health practitioners should form community health councils consisting of professional and lay persons, Dr. Brandhorst suggested. Current needs and demands, future possibilities and the organization of public health units should be determined at the local and state levels, he added, thereby eliminating the possibility of a federal health service plan.

Regardless of the method, he stated, now is the time "to develop an approach to the problem of health services for more people, on a basis which they can afford and with due provisions for the safeguarding of professional standards. In other words, a program that would provide a high standard of health care for the American people."

Interprofessional Relations • After commenting on the high plane of the dental profession's relations with other health service groups, Dr. Brandhorst expressed his hope that the discussions with the medical profession on the definition and scope of oral surgery could clarify the situation.

"There is another area of interprofessional relations which needs our continuing attention," Dr. Brandhorst declared. "For some time there has been an effort on the part of some public health groups arbitrarily to assign the dental division of a state health department to a lower administrative echelon. The dental profession is not prepared to accept such a freehanded edict, particularly since it does not seem to be based on anything more than self-interest. Public health is not the sole concern of any single profession."

Dr. Brandhorst advised constituent societies to watch this development, "lest their state dental health division be reduced to ineffectiveness."

DENTAL HEALTH CONFERENCE

Health programs sponsored by both industry and labor unions were discussed September 26 at the fourth annual Dental Health Conference conducted by the Council on Dental Health. Approximately 150 persons from 36 states, the District of Columbia and the Dominion of Canada attended the conference.

MANAGEMENT'S PROGRAMS

"To provide prompt treatment for accident cases and to prevent and control disease among employees" were the two objectives of health programs sponsored by management listed by McIver Woody, New York physician and chairman of the Medical Advisory Group of the National Association of Manufacturers.

In the opening speech of the Conference, Dr. Woody urged that a balance be maintained in industrial programs between provision for emergency treatment and education for accident prevention.

A survey of health and safety practices among members of the National Associa-

tion of Manufacturers in 3,500 companies reveals that industrial health programs are expanding to include dental services in large companies, stated Maxwell C. Weaver of Cincinnati. Mr. Weaver, president of the Randall Company, is chairman of the N.A.M. industrial health and safety committee.

The survey described by Mr. Weaver in his paper indicated that dental care was provided in 84 companies employing 390,000 persons, and that "proportionately, 10 times as many large companies have dental service as do small companies."

The 28-year history of a dental clinic operated by a large company was described by Howard de Camp, dentist and director of the Corning Glass Works Dental Clinic of Corning, N. Y. The program of the clinic includes prophylaxis, relief of pain, roentgenographic diagnosis, emergency extractions and dental health education for all employees.

The recommendations of the American Dental Association for dental health programs in industry were presented by Ira Dow Beebe of Bridgeport, Conn., chairman of the committee on industrial dentistry of the Council on Dental Health.

Dr. Beebe listed five points advocated by the Association in such programs: (1) a dental examination at the time of employment and periodically thereafter; (2) dental health education programs; (3) referral of employees to private dental practitioners; (4) keeping of accurate dental records, and (5) provision for emergency treatment of employees.

UNION HEALTH PROGRAMS

The rapid growth of union-sponsored health centers and hospital programs indicates the growing interest of union members in health, observed James Brindle of Detroit, acting director of the social security department of the United Auto Workers (CIO).

"Labor wants a comprehensive health program—to be financed by prepayment and one which will protect all the people, not just the working population," he added.

In conclusion he stated, "We in labor want to have access to the kind of care which you in the professions have made possible. With employers accepting the principles of health insurance as an aspect of collective bargaining, labor and the health professions have a new ally in finding the best solution."

Another spokesman for labor unions, George Nelson of Washington, D. C., Grand Lodge representative of the International Association of Machinists, quoted a study made by the University of Michigan which indicated that the total medical debt of American families amounts to more than one billion dollars at the present time.

Factory workers and farmers were found to have the highest percentage of debt, he said, with nearly one family in four owing their physicians.

Pointing to such health centers as the Labor Health Institute of St. Louis, with which 200 firms cooperate, Mr. Nelson suggested that dental societies and labor unions "undertake pilot projects to find the most advantageous program for both our members as the consumer and the dentist as the professional."

"The dental profession's interest in the health program of labor unions is no less than its interest in the health of the individual," said Otto W. Brandhorst of St. Louis in the concluding paper of the conference.

"Conferences such as this can point out to us those areas in which we can formulate agreeable principles," Dr. Brandhorst concluded. "In conferring with each other about suggested plans, the dental profession and the labor union will come to understand the problems which each faces and will cooperate in the solution to these."

STATE SOCIETY OFFICERS

The importance of formulating society policies and programs which will deal effectively with current and future problems was stressed in the all-day Conference of State Society Officers, which met September 27.

The modernization of bylaws will help dental societies to formulate and administer policies more effectively, stated Harold W. Oppice of Illinois.

"Some constituent societies have poor bylaws because they set out no definite line of authority and they are the result of compromises between factions within the society," Dr. Oppice said.

Any group which sets out to modernize a society's bylaws should first formulate the needs of the society. When writing the changes to meet these needs, a language specialist may be employed, Dr. Oppice said, providing that he consults with those who will use and administer the bylaws.

General terms with no administrative details, tight organization in Councils and a straight line of authority were listed as the three factors needed for a good set of bylaws by Harold Hillenbrand, secretary of the Association, who also spoke to the State Society Officers.

"The constitution should contain broad principles, about which there can be little disagreement and which are hard to change. Bylaws should concern year-to-year operations and should implement the constitution. Rules and regulations must deal with the day-to-day operation of the Society and must be simple to change," he summarized.

Component societies in many ways have different problems from both the Association and state societies, remarked Percy Phillips of New York in his talk.

The bylaws of component societies should not conflict, but dovetail with parent organizations' bylaws, Dr. Phillips advised. He suggested that state society officers study their present bylaws to find areas which need elaboration, such as policies on postgraduate courses, publications, research and local ordinances.

"The real problem will be to find a way to avoid a cumbersome document while providing an elaboration on policies," he concluded.

The investment program of dental societies was discussed by Richard H. Samuels, investment counselor of Chicago, who made up a sample portfolio for an imaginary society. He advised such practices as "dollar averaging"—investing at periodic intervals in those stocks which currently seem best.

"Common stocks have a place in your society's investment program," Mr. Samuels stated. "Even when business is due for a downturn, you should have a minimum of 20 per cent of your investments in common stocks with different characteristics." A maximum of 45 per cent common stocks was advised when business is due for an upturn.

Insurance programs for the dental society were discussed by O. B. Sullivan, Milwaukee attorney, and Ray Cobaugh, executive secretary of the Pennsylvania State Dental Society, during the afternoon session.

Other conference speakers included Rudolph H. Friedrich, chairman of the Council on Federal Dental Services, who spoke on the VA dental program; Harold E. Tingley of Massachusetts, who discussed methods of keeping the membership informed; Carl V. E. Cassel of Minnesota, who told of counselling committees and their role in handling complaints, and H. Leon Snow of Michigan, who described a program for a relatively small state society.

Officers of the organization, elected by acclamation, are Bernard N. Walker of Charlotte, N. C., president; Jack Allen Rice of Coeur d'Alene, Idaho, vice-president, and Edgar L. Bessette of Cranston, R. I., secretary.

ASSOCIATED GROUPS

American Academy of the History of Dentistry, at its meeting September 26, established a fund "for an annual award or similar purpose," to which M. D. K. Bremner of Chicago will contribute the royalties from the third edition of his *Story of Dentistry,* soon to be published.

Officers elected at the second annual meeting of the Academy are L. Laszlo Schwartz of New York, president, who succeeds Arthur H. Merritt of New York; William N. Hodgkin of Warrentown, Va., president-elect; Milton B. Asbell of Camden, N. J., vice-president; and Harold L. Faggart of Philadelphia, secretary-treasurer.

American Academy of Periodontology installed Harry Lyons of Richmond, Va., as president at its 37th annual meeting September 26 in Cleveland. Other officers for the coming year include Harold Ray of San Francisco, president-elect; J. E. Aiguier of Philadelphia, treasurer, and Clarke E. Chamberlain of Peoria, Ill., secretary.

American Association of Dental Editors held its annual business meeting September 26 as part of the all-day session conducted jointly with the Council on Journalism of the American Dental Association.

Walter C. McBride of Detroit was installed as president of the A.A.D.E., succeeding Loren B. Taber of San Francisco. Other officers for the coming year are W. W. MacQueen of Minneapolis, president-elect; Ralph Rosen of St. Louis, vice-president; L. F. Bumgardner of Charlotte, N. C., secretary-treasurer, and Albert R. Drescher of Oklahoma City, editor.

The A.A.D.E. went on record as opposed to carbonated beverage advertising in dental journals; expressed sorrow at the death of Grace Rogers Spalding, longtime member of the organization, and accepted committee reports which urged that dental schools teach "the responsibilities, ethics and purposes of dental publications" to senior dental students.

American Association of Dental Examiners at the close of its 70th annual meeting September 26 announced the following roster of officers for the coming year: Archie A. Albert of Pawtucket, R. I., president; Russell I. Todd of Richmond, Ky., president-elect; Carl A. Bumstead of Lincoln, Neb., secretary; Vernon L. Hunt of Eureka, Calif., first vice-president; F. J. Martin of Medford, Wis., second vice-president, and Walter A. Wilson of Trenton, N. J., third vice-president.

American Association of Dental Schools, which met informally on the afternoon of September 26, appointed a committee to study the advisability of offering summer courses for students who have failed subjects during the regular school session.

Leroy R. Boling, dean of the Washington University School of Dentistry, was appointed committee chairman. Dr. Boling had spoken before the group on the possibility of instituting suitable summer programs on a regional basis.

Other speakers were Harry Lyons, dean of the School of Dentistry, Medical College of Virginia, on regional educational programs; Shailer Peterson, secretary of the Council on Dental Education on admission of foreign dental students; R. H. Sullens, assistant secretary of the Council on Dental Education, on dental internships, and Col. Richard H. Eanes, chief medical officer at Selective Service national headquarters, on Selective Service regulations.

American Association of Public Health Dentists presented its distinguished service award to H. Trendley Dean of Chi-

cago, secretary of the Association's Council on Dental Research, at its annual meeting September 27.

Francis A. Bull of Madison, Wis., was installed as president of the organization. Other officers are: Fred Wertheimer of East Lansing, Mich., president-elect; Roy D. Smiley of Indianapolis, secretary-treasurer; Carl A. Sebelius of Nashville, Tenn.; William H. Rumbel of Richmond, Va., and Norman F. Gerrie of Denver, members of the executive council.

American College of Dentists awarded the degree Fellow of the College to 158 dentists from the United States, Canada, France and Australia during its September 27 meeting in Cleveland. Honorary fellowships were also awarded to Charles B. Bolton, prominent Cleveland businessman and philanthropist, and Shailer Peterson, secretary of the Council on Dental Education.

Harry S. Thomson of Toronto, Canada, was installed as president of the College; James H. Ferguson, Jr., of Baltimore as president-elect, and Harold MacKechnic Cline of Vancouver, B. C., as vice-president. Otto W. Brandhorst of St. Louis was re-elected secretary, and William N. Hodgkin of Warrenton, Va., was re-elected treasurer.

New members of the Board of Regents are E. B. Penn of Miami; Harold J. Noyes of Portland, Ore., and Samuel R. Parks of Dallas, Texas.

The American Dental Assistants Association, which met September 28-October 1 in Cleveland, installed Mrs. Lillian Hoffman of Akron, Ohio, as president. Other officers for 1953-54 are: Miss Ruth Doring of Montclair, N. J., president-elect; Miss Bessie Peterson of Waterloo, Iowa, first vice-president; Miss May Frances Joiner of Macon, Ga., second vice-president; Mrs. Magdalene Kulsted of La Habra, Calif., third vice-president; Miss Nita Browning of Salt Lake City, general secretary, and Miss Harriett Darling of Huron, S. D., treasurer.

American Dental Hygienists' Association closed its five-day annual meeting October 1 with the installation of Miss Laura Peck of New London, Conn., as president for the coming year. Shailer Peterson of Chicago, secretary of the Council on Dental Education, was granted an honorary membership in the organization.

In addition to the president, the following officers were elected during the meeting: Miss Sarah Hill of Memphis, Tenn., president-elect; Miss Marjorie Thornton of Des Moines, Iowa, first vice-president; Miss Alice Scales of Washington, D. C., second vice-president; Mrs. March Fong of Oakland, Calif., third vice-president; Miss Margaret E. Swanson of Washington, D. C., secretary; Miss Ruth Heck of Philadelphia, treasurer, and Miss Belle Fiedler of Appleton, Wis., editor.

American Dental Interfraternity Council at its annual luncheon September 29 installed Irving H. Goldstein of Atlanta, Ga., president; P. G. Puterbaugh of Peru, Ind., vice-president, and John C. Brauer of Chapel Hill, N. C., secretary-treasurer.

American Denture Society, which held its 25th annual meeting September 26, announced that annual awards of $500 and $250 will be given the two senior dental students who submit the best essays on prosthetic dentistry to the *Journal of Prosthetic Dentistry.*

Victor L. Steffel of Columbus, Ohio, was installed as president of the Society, succeeding Chester Perry of Detroit. Other officers are: Cecil H. Bliss of Sioux City, Iowa, president-elect; Samuel S. Cohen of Cleveland, vice-president, and Arthur L. Roberts of Aurora, Ill., secretary-treasurer.

American Society of Dentistry for Children announced the publication of a pamphlet, *Pointers for Parents,* which it had approved for use in pedodontic practice. The Society also asked that more

stress be placed on the preschool child in publicity for Children's Dental Health Day.

Hugh Keenan of Corning, N. Y., was inducted as president of the Society. Other officers are Willard Hunnicutt of Atlanta, Ga., president-elect; Henry M. Wilbur of Louisville, Ky., vice-president, and Albert Anderson, Jr., San Diego, secretary-treasurer.

Association of American Women Dentists, which held its 31st annual meeting in Cleveland, announced the establishment of the Dr. Serena Friedman Award which will be given annually to the senior woman dental student submitting the best report on her periodontic studies. The award fund was contributed by Regina David of Cleveland, retiring president of the organization, in memory of the late Dr. Friedman, who was also a Cleveland dentist.

Officers for the coming year are: Bertha L. Eastwood of Philadelphia, president; Josephine M. Irey of Denver, president-elect, and Mary C. De Risi of Washington, D. C., secretary.

Delta Sigma Delta held its 69th annual Supreme Chapter meeting September 25-28 in Cleveland, electing the following roster of officers: Myron A. Roberts of Buffalo, Supreme Grand Master; Virgil A. Kimmey of St. Louis, Supreme Worthy Master; Stephen G. Applegate of Detroit, Supreme Scribe, and Edward F. Mimmack of Buffalo, Supreme Treasurer.

Other officers are Cedric F. Harring of Boston, Supreme Historian; Gustav A. Svetlik of Cleveland, Supreme Senior Page; J. Randle Luten of Little Rock, Ark., Supreme Junior Page, and Frank O. Clifford of Kokomo, Ind., Tyler.

The International College of Dentists on September 27 invested the following roster of officers for 1953-54: Fred A. Richmond of Kansas City, Kan., president; Joseph B. Kennedy of Des Moines, Iowa, president-elect; C. I. Perschbacher of Appleton, Wis., vice-president; Elmer S. Best of Minneapolis, secretary, and Roy F. West of Seattle, treasurer.

National Association of Seventh-Day Adventist Dentists elected Albert C. Koppel of Washington, D. C., president; Claudius C. Ray of Miami, vice-president; Franklyn Nelson of Pomona, Calif., secretary-treasurer, and Roland E. Mallernee of Atlanta, Ga., editor, at the organization's tenth annual meeting.

American Academy of Gold Foil Operators re-elected Bruce B. Smith of Seattle as president for 1953-54 during its annual meeting September 27. Charles Stebner of Laramie, Wyo., was named to the new office of president-elect, and Gerald D. Stibbs of Seattle was re-elected secretary-treasurer.

Dental Societies

CHICAGO DENTAL SOCIETY PLANS MIDWINTER MEETING

The 89th annual Midwinter Meeting of the Chicago Dental Society, to be held February 7-10 at the Conrad Hilton Hotel in Chicago, will feature an address by Walter Judd, Congressman from Minnesota and famed medical missionary.

The scientific program of the meeting will consist of essays, limited attendance clinics and table clinics. The scientific sessions and exhibits will open on the morning of Monday, February 8; technical exhibits will open on the afternoon of February 7 after morning registration.

An essay on anesthesia will be delivered by Max S. Sadove, head of the department of anesthesiology at the University of Illinois College of Medicine, and a symposium on local anesthesia in

dentistry will be presented by distinguished panelists, announces Lyle F. Aseltine of Chicago, general chairman of the Midwinter Meeting.

Inquiries about the meeting may be addressed to the Chicago Dental Society, 30 North Michigan Avenue, Chicago 2.

DENTAL CARE IN INDUSTRY TOPIC OF NEW YORK WORKSHOP

Two panel discussions will be featured at the second Public Health Workshop on Dental Care in Industry, to be presented January 22 at the Hotel Statler, New York, by the First District Dental Society of the State of New York.

Oral health standards for the employee on the job will be discussed by a panel composed of Anthony J. Lanza of the Postgraduate Medical School of New York University; Robert C. Page, an industrial physician; W. Philip Phair, secretary of the Council on Dental Health of the American Dental Association; and Ira Dow Beebe, chairman of the Council's committee on industrial dental health programs.

The scope of dental services in occupational health programs will be discussed by a panel composed of C. E. Marshall-Day of Boston, dean of the Tufts College Dental School; Howard E. DeCamp, dentist in charge of an industrial dental clinic, and Winslow Carlton, insurance executive.

Dental Education

DEDICATION PROGRAM PLANNED AT UNIVERSITY OF BUFFALO

The University of Buffalo will dedicate its new medical and dental schools building, Samuel P. Capen Hall, on December 11-12 with a program of scientific symposiums, including discussions on dental education and oral surgery.

Maynard K. Hine, president of the American Association of Dental Schools and dean of the University of Indiana School of Dentistry, will participate December 11 in a discussion on medical and dental education. His address is entitled "Trends in Dental Education."

Leon J. Gauchat, dean of the University of Buffalo School of Dentistry, will preside at the December 12 symposium on "Diagnosis in the Field of Oral Surgery." Participants will include William F. Harrigan, professor of oral surgery at New York University College of Dentistry, and four members of the oral surgery faculty at the University of Buffalo School of Dentistry; they are Bernard G. Wakefield, Maxwell D. Farrow, Charles W. Pankow and Edward T. Butler. Samuel P. Capen is Chancellor Emeritus of the University.

DENTAL INTERNSHIPS OFFERED BY NORTH CAROLINA HOSPITAL

Two internships in general dentistry extending for one year are being offered by the Charlotte Memorial Hospital of Charlotte, N. C. Training includes participation in the operation of the Hospital clinic under supervision of a staff dentist. Regular visits are also made to private offices of dentists in general or specialty practice.

A monthly stipend of $100 is provided in addition to meals and laundry. Further information may be obtained from R. Z. Thomas, Jr., administrator of the Charlotte Memorial Hospital, 1400 Scott Avenue, Charlotte, N. C.

KANSAS CITY DENTAL SCHOOL PLANS ORAL SURGERY PROGRAM

The University of Kansas City School of Dentistry is accepting applications for a two-year graduate program in oral surgery leading to a master's degree. This includes one year of academic work in the basic sciences and one year of residency at General Hospital. The class will be chosen in March, it has been announced by John D. Gehrig, director of oral surgery.

Further information may be obtained from Dr. Gehrig at the University of Kansas City School of Dentistry, 1108 East Tenth Street, Kansas City 6, Mo.

UNIVERSITY OF WASHINGTON NAMES ASSISTANT DENTAL DEAN

Berton E. Anderson, associate professor of dentistry at the University of Washington, was named assistant dean of the School of Dentistry October 31.

Dr. Anderson has been director of admissions and secretary of the dental school faculty since 1948. He has served also as director of postgraduate dental education and executive officer of the department of dental science and literature since 1950. He formerly was president of the Seattle District Dental Society and secretary-treasurer and editor of the Washington State Dental Association.

B. E. Anderson

G. A. GRUBB, FORMER DEAN AT NEBRASKA, DIES

George A. Grubb of Lincoln, Neb., former dean of the University of Nebraska School of Dentistry, died November 1 at the age of 73. Dr. Grubb was dean during 1923-1939 as well as professor of operative dentistry and of dental literature and science.

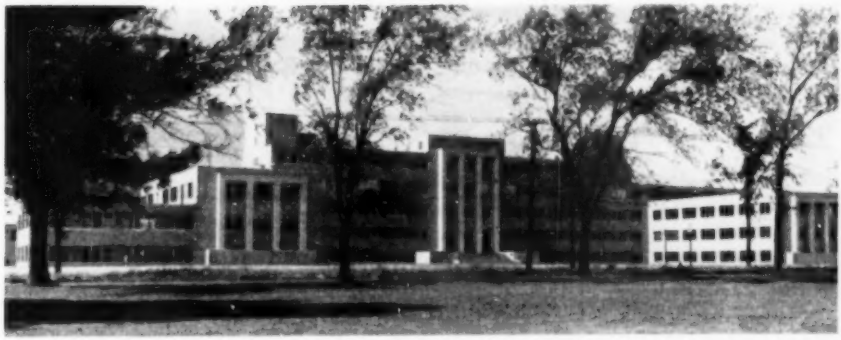
G. A. Grubb

Active in state and national dental organizations, he served as secretary, treasurer, vice-president, president and editor (until 1951) of the Nebraska State Dental Association, vice-president and member of the executive committee of the American Association of Dental Schools and president of Xi Psi Phi.

He was a 40-year member of the American Dental Association, serving for many years in the House of Delegates. He was also a member of Omicron Kappa Upsilon and the International College of Dentists.

DENTAL SCHOOLS ANNOUNCE POSTGRADUATE COURSES

California • The University of California Extension dental program will offer a course in dentistry for children, consisting of lectures and clinics by Charles Sweet, Irwin Beechen and Clinton Emerson. Meetings will be held 8:30-5:30 January 24-29 at Harbor General Hospital, Torrance, Calif.



The University of Buffalo's new Samuel P. Capen Hall, shown above, which houses the medical and dental schools of the University, will be dedicated December 11-12, announces Leon J. Gauchat, dean of the School of Dentistry. The building was recently completed at a cost of $4,500,000. The dedication program, featuring two days of scientific symposiums, is open to all interested dentists.

Further information may be obtained from the University of California Extension dental program, 815 South Hill Street, Room 211, Los Angeles 14.

Columbia • A course on the principles of occlusion, consisting of lectures, clinical demonstrations, seminar conference and group participation will be given by Professor Lewis Fox and associates January 13-15 at Columbia University School of Dental and Oral Surgery.

Further information may be obtained by writing to Barnet M. Levy, director of the postgraduate division, School of Dental and Oral Surgery, Columbia University, New York 32.

Pennsylvania • Two courses presenting recent advances in theory and practice of complete denture prosthesis will be presented by M. M. DeVan and associates at the School of Dentistry, University of Pennsylvania. The first will be presented January 25-30; the second, starting March 8, will meet one day a week for six weeks.

A course on crown and bridge prosthesis will be presented February 22-27 by Charles B. Sceia for general practitioners and those with limited experience in oral rehabilitation.

A concept of full denture construction based on anatomical constants will be presented in a postgraduate course March 8-13 by Fred A. Slack, Jr. A specific technic will be emphasized and clinical participation will be expected of registrants.

Inquiries may be addressed to postgraduate courses, School of Dentistry, University of Pennsylvania, 4001 Spruce Street, Philadelphia 4.

Temple • A postgraduate course in periodontics will be presented by Jacoby T. Rothner and the periodontics staff of Temple University School of Dentistry, beginning February 11, 1954. Sessions will extend from 9 A.M. to 4 P.M. on seven successive Thursdays.

A six-day course in occlusal rehabilitation under the direction of Louis Alexander Cohn of New York will begin February 1 and will include lectures and demonstrations with clinical patients.

Information may be obtained from the director of postgraduate studies, Temple University School of Dentistry, 3223 North Broad Street, Philadelphia 40.

Toronto • Three continuation courses for graduates in dentistry have been scheduled by the Faculty of Dentistry, University of Toronto. They are:

Periodontics, January 18-22, H. K. Box and C. H. M. Williams; operative dentistry, February 15-19, P. G. Anderson; endodontics, March 8-12, G. C. Hare and guest lecturer F. D. Ostrander.

Inquiries may be addressed to the dean, Faculty of Dentistry, University of Toronto, 230 College Street, Toronto 2-B, Ontario, Canada.

Tufts • The following courses in periodontology will be presented at Tufts College Dental School during the coming term:

Participation course in periodontology, April 12-16, Irving Glickman and staff; Kirkland gingivectomy technic, May 17-21, Olin Kirkland; occlusal equilibration, Mondays, January 11-February 8, Edward T. Fischer.

Application may be made by writing to the director, division of graduate and postgraduate studies, Tufts College Dental School, Boston 11.

Public Health

USPHS TO HOLD EXAMINATIONS FOR DENTAL OFFICERS

The United States Public Health Service will conduct a competitive examination March 2-4, 1954 for appointment of dental officers in the Regular Corps. The examinations will be held at a number of points throughout the United States, located as near as possible to the homes of the candidates. Completed applications must be received by the USPHS Washington office by January 22.

Candidates are required to be citizens of the United States, at least 21 years of age and graduates of an approved dental school. Candidates with at least seven years of collegiate and professional training and experience will be appointed assistant dental surgeons (equivalent to the Navy rank of lieutenant, j.g.); those with 10 years of training and experience will be appointed senior assistant dental surgeons (equivalent to lieutenant).

Application forms and detailed information may be obtained from the chief of the division of commissioned officers, Public Health Service, Department of Health, Education and Welfare, Washington 25, D. C.

OTTO W. BRANDHORST NAMED HOOVER COMMISSION ADVISER

The newly-appointed medical advisory group to the Hoover Commission now studying reorganization of the executive department includes Otto W. Brandhorst of St. Louis, past president of the American Dental Association.

In addition to Dr. Brandhorst, the committee includes 13 physicians and one layman, the chairman, Chauncey McCormick of Chicago.

LOCAL CONFERENCE DISCUSSES DENTAL HEALTH EDUCATION

A local conference on dental health education was held November 4-5 in Rochester, N. Y., conducted by the Rochester Dental Society under the sponsorship of the Seventh District Dental Society of the State of New York.

"Dental Health Education Responsibilities of the Dentist—to the Patient, the Community, the School" was the theme of the meeting, which was attended by 120 dentists, educators and public health personnel.

During the all-day session November 5, conference members were divided into six groups, each discussing various problems connected with dental health education in Rochester and surrounding communities. Harold D. Bowman of Rochester was chairman of the conference. The keynote address was delivered at a dinner meeting November 4 by W. Philip Phair, secretary of the Council on Dental Health. A booklet on staging similar conferences is planned by the Council.

International

F. D. I. TO AWARD PRIZE FOR DENTAL RESEARCH

The Albert Joachim International Prize "for the best purely scientific research in the field of odontostomatology" will be awarded for the first time at the Fédération Dentaire Internationale's XIIth International Dental Congress, to be held in 1957 at Rome.

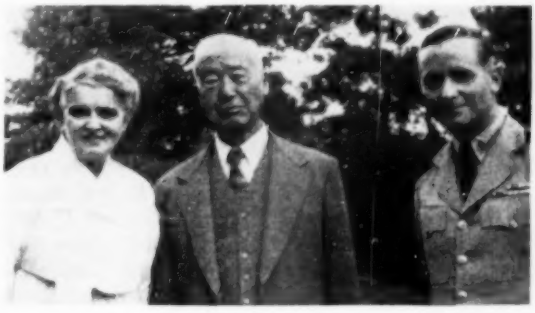
The award, amounting to 50,000 Belgian francs ($1,000) recently was instituted—together with the Albert Joachim Foundation—to commemorate the 50th professional anniversary of Dr. Joachim, Belgian representative to the Fédération for the past 40 years. He is a vice-president of the F.D.I. and an eminent member of the Belgian dental profession.

At the request of the Foundation, the award will be made by a jury appointed by the F.D.I. Council, it has been announced by Gerald H. Leatherman of London, secretary general of the Fédération.

Only research work that is strictly original and as yet unpublished will be considered in the competition. Rules of the competition will be published later; meanwhile, inquiries may be addressed to Dr. Leatherman at 35, Devonshire Place, London, W. 1, England.

FÉDÉRATION'S U. S. TREASURER ANNOUNCES NEW ADDRESS

The office of the United States treasurer of the Fédération Dentaire Internationale, Philip E. Adams of Boston, is now at 170 Marlborough Street. Dentists who wish to become supporting members of the Fédération or who wish to subscribe to the *International Dental Journal* are requested to write to Dr. Adams at his new address.



Syngman Rhee, president of the Republic of Korea (center), is shown with Mrs. Rhee and Lieut. Charles Elder Rounds, DC, USN, of Boston, after a recent luncheon at the Korean President's home. Dr. Rounds was invited as "a fellow alumnus of Princeton University" to leave his front-line surgery to attend a reception given for the officers of the U.S.S. New Jersey by President and Mrs. Rhee.

General

ARMY PROMOTES 156 DENTISTS AFTER DRAFT DIRECTIVE

The draft regulations issued last month by the Defense Department to implement Public Law 84, the revised special draft law, will result in the promotion of 156 dentists in the Army Dental Corps, it has been announced.

The recalculation of professional experience in fixing the rank of officers also will affect an estimated 1,000 medical and dental officers in the Navy and Air Force.

INTER-AMERICAN CONGRESS TO BE CONDUCTED ON CRUISE

The dentistry section of the Pan American Medical Association will participate in the organization's ninth Inter-American Cruise Congress to South America and the West Indies January 6-22.

The Congress will include scientific sessions and panel discussions both at sea and in the ports of Caracas, Venezuela; San Juan, Puerto Rico; Ciudad Trujillo, Dominican Republic, and Havana, Cuba. Participants will include dentists from the United States, Central and South America.

Further information on the Cruise Congress may be obtained from the Pan American Medical Association, Executive Offices, 745 Fifth Avenue, New York 22.

ORAL SURGERY BOARD ELECTS OFFICERS FOR 1953-54

The American Board of Oral Surgery, at its meeting October 17-21 at Houston, elected the following officers: James R. Cameron of Philadelphia, president; Don H. Bellinger of Saginaw, Mich., vice-president, and Leslie M. FitzGerald of Dubuque, Iowa, secretary.

TIM HARDGROVE HONORED BY WISCONSIN MEDICAL SOCIETY

The Wisconsin State Medical Society has honored a dentist of Fond du Lac, Wis., Timothy A. Hardgrove, for his work in dental research and the education of crippled children.

The council of the Medical Society declared that Dr. Hardgrove had "achieved singular recognition as a distinguished practitioner, an imaginative dental researcher and as a leader among men." His name and the achievements of his 50-year career were entered in the Medical Society's permanent records in order "that those who in future years are dedicated to serve the health of their fellow men may seek to emulate you."

A leader in the promotion of fluoridation of public water supplies, Dr. Hardgrove is a former vice-president of the American Dental Association and past president of the Wisconsin State Dental Society.

ENDOW ORAL SURGERY AWARD TO HONOR THEODOR BLUM

A fund for the establishment of the Theodor Blum Oral Surgery Award was presented to the University of Pennsylvania School of Dentistry October 28 at a dinner honoring Dr. Blum. Lester W. Burket, dean of the School, and 300 other friends and colleagues of Dr. Blum attended the dinner. The award will be given annually to a senior student at the School, from which Dr. Blum was graduated in 1909.

PROSTHODONTICS BOARD TO REVIEW APPLICATIONS

The next meeting of the American Board of Prosthodontics will be held February 1-7, 1954. Those candidates who wish to have their applications considered should send them to the Board secretary as soon as possible, it has been announced by

R. H. Kingery of Ann Arbor, president. Inquiries may also be addressed to the secretary, S. Howard Payne, University of Buffalo School of Dentistry, Buffalo 14, N. Y.

SOCIETY OF ORAL SURGEONS ANNOUNCES NEW OFFICERS

The American Society of Oral Surgeons, which met October 21-24 in Houston, Texas, installed Don H. Bellinger of Saginaw, Mich., as president; C. Stanley Rice of Beverly Hills, Calif., as president-elect and Harry M. Seldin of New York City as vice-president.

Two officers were reappointed; they are Frank B. Hower of Louisville, Ky., secretary-treasurer, and Ruth F. Whalen of Richmond, Va., executive secretary. The new Council member is W. T. Foster of San Antonio, Texas.

The Society will meet November 3-6, 1954 in Miami during the week preceding the 95th annual session of the American Dental Association.

EFFICIENT USE OF PERSONNEL IN HOSPITALS URGED

"A policy of utilizing nurses only at their highest skills," is suggested in the new booklet, *Meeting Your Hospital Personnel Shortage,* which has been prepared by the Health Resources Advisory Committee of the Office of Defense Mobilization.

Howard A. Rusk, chairman of the Committee, has requested that state dental society officers and dental school deans urge their colleagues and students to "modernize their technics of personnel utilization" in order to relieve the shortage of graduate nurses.

In many cases, a patient should be taught to do for himself many things that customarily have been done for him by nursing personnel, the Committee advises.

Among other suggestions for utilizing professional personnel most efficiently are the following:

Physicians are responsible for determining the work load of the hospital. Dentists on hospital staffs have a similar responsibility. The professional staff should work steadily toward the most effective use of personnel by:

a. Reviewing daily orders and standing orders for patients, discontinuing and avoiding the unnecessary orders, and making a clear distinction between emergency and routine orders.

b. Facilitating prompt discharges and admissions according to hospital policy.

c. Recognizing the economy of scheduling hospital rounds, treatments and surgical procedures to fit into essential hospital routine.

d. Cooperating with the standardizing of supplies and equipment and using stock items whenever possible.

e. Completing medical reports promptly.

f. Teaching patients self care and the activities of daily living. This is an important part of early ambulation and rehabilitation.

g. Requesting private duty nurses only when this is essential to the safety and welfare of the patient.

SURVEY SHOWS SHARP RISE IN DENTIFRICE SALES, 1950-52

In 1952 the American people spent $141,720,000 for dentifrices and $44,310,000 for toothbrushes, according to a recent survey conducted by the magazine *Drug Trade News.*

Of the total spent for dentifrices, 25 per cent was spent for chlorophyll tooth paste compared with 66 per cent spent for other tooth pastes. Tooth powders accounted for nine per cent and liquid dentifrices for only 0.2 per cent of the total dentifrice expenditures.

The report indicated that expenditures for dentifrices increased 27 per cent from 1950 to 1952. While sales of chlorophyll tooth paste became sizable during this period, the decrease in sales of other tooth paste was relatively small. Sales of tooth powders decreased by one-fourth during the two-year period.

Total 1952 expenditures for oral hygiene products, including mouth washes and gargles, were estimated at $227,770,000.

A.A.A.S. TO GIVE SYMPOSIUMS ON DENTISTRY DECEMBER 29

Two additional symposiums have been arranged for presentation at the dentistry section meeting of the American Association for the Advancement of Science in Boston, December 29.

Pathologic disturbances of the dental pulp resulting from dental operative procedures will be discussed on the afternoon of December 29. Helmut A. Zander of Minneapolis will preside; participants will include Isaac Schour of Chicago, Vincent F. Lisanti of Boston and Gerrit Bevelander of New York.

A symposium on periodontics, to be presented in the evening, will be presided over by Cyril D. Marshall-Day of Boston. Participants will include Samuel Truesky of Boston, Leo M. Sreebny of Chicago, David Weisberger of Boston and Irving Glickman of Boston.

The morning symposium, reported in the November issue of THE JOURNAL, will concern recent animal experimentations in caries research.

SIGMA EPSILON DELTA PLANS ANNUAL DINNER DECEMBER 8

Sigma Epsilon Delta fraternity will hold its annual dinner in conjunction with the Greater New York Dental Meeting at 6 P.M., Tuesday, December 8, in the Hotel Statler.

The dinner will be given in honor of Edward Wasserman of Philadelphia "for more than 30 years of service to the fraternity." Reservations may be obtained from Samuel Brookner, chairman of the dinner committee, 173 West 78th Street, New York 24.

Also . . . Frank Brown Berry, New York surgeon, will succeed Melvin A. Casberg as Assistant Secretary of Defense for health and medical affairs January 1. Dr. Berry, on the faculty of the Columbia University medical school, was a brigadier general in the U. S. Army. . . . Leonard A. Scheele, Surgeon General of the U. S. Public Health Service, was installed as president of the Association of Military Surgeons November 11 at the organization's 60th annual convention. . . . The First District Dental Society of the State of New York presented its annual Henry Spenadel Award October 4 to William D. Coolidge of Schenectady, N. Y., who in 1908 invented the tube now used universally in dental roentgenology. . . . The Chicago Dental Society has announced the adoption of advertising and exhibit standards identical with those of the American Dental Association. . . . Maurice Y. Nicole of San Francisco is the new president of the National Association of Dental Laboratories, succeeding G. Paul Stough of Cleveland. . . . The Journal of the American Medical Association, after a survey of physicians, has announced that it will accept no more cigaret advertising after January 1.

British dentists and the National Health Service

In a recent address the president of the British Dental Association, Edgar Houghton, outlined the story of the British dental profession's experience with the National Health Service. As readers of THE JOURNAL have shown an interest in the current situation in Britain, the following excerpts from Dr. Houghton's address are reprinted from the *British Dental Journal:*

The [British Dental] Association, through its representatives, is the body which has had to make contact with the politicians in connection with the National Health Service, and in the period prior to the passing of the Act in 1948 it freely gave much time and thought to the consideration of the advice which was ultimately put before the [former] Minister of Health as to the best way in which the services of the dental profession could be utilized.

The advice given was sound and unselfish, but it was completely ignored by the Minister who, instead, imposed upon us a scheme which was a vote-catching political expedient and to us as a profession, completely hateful. This scheme was never approved by the Association and I hope never will be.

You all know what happened. The profession, overwhelmed by the demand for free dentures and treatment, did what it could to cope with the avalanche of work which necessitated many extra hours at the chairside and in many cases involved serious loss of health or even complete breakdown.

Some practitioners made what appeared to be fantastically high incomes and these examples were most unfairly publicized, generally without an explanation that the figures were gross and not net incomes. No credit was given for the great mass of conscientious work done by the majority of our colleagues under these appalling conditions. On the contrary, this state of affairs—his own fault—was seized upon by the Minister, most unfairly, as an excuse for imposing cuts in the scale of fees without consultation and without paying any regard whatever to the equitable distribution of the reduced remuneration available.

It must be admitted that, in spite of the ill-considered nature of the regulations governing the general dental service, a great amount of benefit has been received by a large part of our population. This, however, is due not to the efforts of politicians but to the conscientious and cruelly hard work carried out by the general dental practitioner. The tragedy is that so much of this hard work is merely a breakdown service and of no lasting value.

Another benefit which has accrued, probably accidentally, is that the conditions created by the 1948 Act have necessitated increased remuneration for those engaged in the teaching of dentistry. An academic career is now not only attractive for its own sake, but also provides an adequate standard of living, and I have no hesitation in saying that we now possess dental teachers who are the equal of any in the world and who are turning out dental graduates whose skill and learning should be an enormous asset to our profession.

However, under present increasingly restrictive conditions, I do not see how this modern scientific knowledge can be fully utilized for the benefit of the community. Herein lies a grave danger to our profession. I have heard dental teachers say, "What is the use of teaching students all this advanced knowledge and technic when we know quite well that their opportunity of using it is becoming less and less under present conditions." From this attitude it is a very short stride to the lowering of the standard of the curriculum and that is a policy we must fight tooth and nail! We must retain our high standards and make sure that the dental service will be able to use our knowledge and skill to the limit. . . .

When contact with politics is found to be unavoidable, one is bound to observe how, on the one hand, a body of people like ourselves becomes the pawn of political expediency and how, on the other, an able and sensible man like the present Minister of Health is unable to carry out the improvements and alterations which he knows are essential for the better administration of the dental health service. What a pity we have to have anything to do with party politics when we are dealing with a professional matter vitally concerning the health of our people!

I think it may with all fairness be stated that the present scheme for a national dental service is a failure. This failure is in large part due to the ignoring by the Minister of advice from men of ability and highmindedness, whose concern has always been the welfare of the community and the dental profession, which are wholly interdependent.

International Correspondence

NEWS FROM GREAT BRITAIN

ROYAL COLLEGE OF SURGEONS

E. Wilfred Fish writes that October was an important month for the Faculty of Dental Surgery of the Royal College of Surgeons, for not only did the winter program of postgraduate lectures start, but on October 16 the Board of the Faculty met and elected a new dean and vice-dean.

Prior to this, a vote of condolence was moved by G. H. Leatherman to the relatives of the late A. E. Rowlett, whom many of our American colleagues knew well. His death is a great loss to the cause of international dentistry and a great personal sorrow to all who were working with him.

The office of the dean of the Faculty falls vacant each year, and the dean is eligible for re-election. It is, however, the custom for one man not to hold the office for more than three consecutive years. Sir William Kelsey Fry's tenure terminated October 9, after three eventful years in which he rendered outstanding service to the Faculty and to the College—a service which has been recognized by the conferring of the Honorary F.R.C.S. on him.

Professor F. C. Wilkinson, director of the Postgraduate Institute of Dental Surgery is the new dean, and Professor H. H. Stones, professor of dental surgery of Liverpool University and editor of *The International Dental Journal*, is the new vice-dean. In both cases the choice is a happy one, and in the appointment of Professor Wilkinson the Board of Faculty has guaranteed an even closer coordination of clinical instruction at the Postgraduate Institute with the scientific teaching at the College.

NATIONAL HEALTH SERVICE

John W. Gilbert writes some interesting details regarding remuneration in the National Health Service: Dental remuneration under the N.H.S. is based on an itemized scale of fees, and since the inception of the Service in July 1948, a number of changes have been made in the original scale. The first reduction was a deduction of 50 per cent of gross earnings in excess of £400 per month.

Later this was rescinded and an over-all reduction of about 20 per cent was introduced —to be followed by a further reduction of 10 per cent on the scale. At first sight the effect of these reductions might appear to be less than is actually the case, for the reduction is on the gross earnings and, since expenses are assessed at 52 per cent of the gross figure, the first reduction totaled 41.7 per cent and the second reduction totaled 58.3 per cent of the net remuneration of the practitioner.

There also have been introduced regulations which imposed on the patient (a) as from May 21, 1951 the responsibility of paying about half of the cost of dentures, and (b) as from June 1, 1952 the payment of £1 toward the cost of treatment. Exemption from this latter charge is given to expectant mothers, mothers who have had a child within the past 12 months and persons under 21.

The scale of fees, originally mainly negotiated, has twice been arbitrarily reduced. These reductions, together with general financial hardships and the imposition of charges, resulted in a serious fall in the incomes of many practitioners in the General Dental Service. Some dentists were obliged, solely by financial duress, to give up their practices and enter the school dental service as full-time salaried officers. According to the Minister of Education, Miss Florence Horsburgh, in January 1952 there were 713 full-time school dentists and in October 1953 this number had risen to 928. Others have been in serious financial difficulties; the profession generally is dissatisfied with the present level of remuneration and frequently calls on its leaders to obtain an increase.

The Minister of Health, who can alter the scale of fees by regulation, was approached by the British Dental Association some months ago in an endeavor to obtain, as an immediate amelioration, the restoration of the 10 per cent cut. The Minister insisted that any review of the scale can be considered only on the findings of an inquiry into dentists' incomes and expenses. Arrangements for this survey are to be made soon at a meeting between representatives of the profession and of the Ministry of Health.

The proposed inquiry is likely to take many months and in the meantime the profession is restless—to the extent of circulating a questionnaire to local dental committees seeking

information of the support likely for a complete withdrawal from the Service if the present level of remuneration is not improved!

BRITISH DENTAL ASSOCIATION

W. Stewart Ross sends news of the British Dental Association as follows:

Memorial Service for the late A. E. Rowlett • A service was held October 30 in London in memory of Alfred Earnest Rowlett, aged 76, of Leicester. He held among many offices that of past president of the British Dental Association and president of honor of the Fédération Dentaire Internationale.

A large gathering of members of the dental profession was present to do homage to a man who has been described as one of the greatest figures in international dentistry. The Fédération was represented by Ch. F. L. Nord of Holland, immediate past president; J. Stork of Holland, honorary treasurer; G. H. Leatherman of Great Britain, secretary general; J. Deliberos of France, a vice-president, and W. Stewart Ross of Great Britain, chairman of the Council. Representatives of a number of national Associations, including the American Dental Association, were present.

Representative Board of the British Dental Association • The Board, which consists of 118 elected representatives from 20 branches of the Association, met October 30-31 and heard Professor Bradlaw, leader of the British delegation to the XLIst annual meeting of the F.D.I. in Oslo, July 1952, report on the business of the meeting. Dr. Nord, Dr. Stork and Dr. Deliberos from Europe were introduced to the chairman, W. R. Tattersall, and members of the Board, and cordial greetings were exchanged between the respective dental associations.

Fluoridation • The Representative Board also discussed the question of fluoridation in Great Britain and recommended that experiments be carried out in this country, as circumstances may be somewhat different from those in the United States. This opinion is in line with the recommendations in a white paper produced by the United Kingdom mission to the United States which studied the question.

There is little doubt that the dental profession in Great Britain is aware of the exhaustive research that has been carried out in the United States for many years, and there is a general desire to initiate preliminary investigations as soon as possible.

Subscription Increase • Increased expenses in all departments have forced the British Dental Association to raise membership subscriptions from 4.4.0 to 6.6.0 per year. Membership is now approximately 10,650, which represents 90 per cent of the profession in Great Britain in active practice.

B.D.A. Presidency • T. Hindle has been elected president of the B.D.A. for 1954, and the annual meeting will be held in Blackpool May 10-15 next year.

PRIVATE PRACTITIONERS

C. de Vere Green, who informs us of the private practitioner not in the Health Service, states that it may come as a surprise to read that less than one per cent of the total number of dental practitioners in Great Britain are not practicing under the National Health Service. Nevertheless, there appears to be an increasing demand for high type of dental work for which the patient pays a fee in addition to his compulsory weekly Health Service contribution.

Naturally, it is the small group of private practitioners who take the greatest interest in learning of new technics and materials. For example, Lt. Col. Allan Brewer of the U.S.A.F. Dental Corps during his service in this country generously gave lectures, demonstrations and clinics on full denture technic primarily for those not practicing in the Health Service, where the maximum fee obtainable for a full upper and lower denture is £9 (approximately $27.).

The American Dental Society of London, composed for the greater part of men holding an American or Canadian dental degree, has found a new home. This Society, which has met in the larger hotels or clubs and has held its meeting round the dinner table, will in the future be meeting and dining in the library of the Royal College of Surgeons of England at Lincoln's Inn Fields. The members are anticipating many years of happy and beneficial association with that world renowned College.

I would like to take this opportunity to send Christmas greetings to our friends and colleagues in the United States and our best wishes for 1954.

G. H. Leatherman, D.M.D., F.D.S.R.C.S.

The Reader Comments

THE JOURNAL *devotes this section to comment by readers on topics of current interest to dentistry. The editor reserves the right to edit all communications to fit available space and requires that all letters be signed. At the request of the author, signatures will be deleted before publication. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your participation in this section is invited.*
The Editor

STATUS OF DENTAL RESEARCH

Your editorial in a recent issue does well to call attention to the inadequacy of 1.1 per cent as dentistry's share of research funds.

Those who allocate funds should realize that the very diseases which swallow up research funds—cancer, mental, heart, arthritis and metabolic disturbances, neural disease—are those which appear in common with dental disease in hitherto healthy communities when people become displaced from the healthy environment (Weston Price, Pickerill, et al).

The special claim of dentistry should be that owing to their accessibility, to their unique hardness and to their incapacity for self-repair, the dental tissues afford more complete information than any of the other tissues offer to their respective specialties.

The dental tissues should, therefore, have just claim as the most convenient indicator for use by research workers investigating the basic factors of degenerative disease. It may well be that dental studies in their relation to ecology may lead to knowledge about tissue degeneration of which research along other lines to date has given no clue.

Everard Turner, L.D.S., Leicester, Eng.

REPLY TO CRITICISM OF SELF-CURING RESINS STUDY

I have read Helmut Zander's comment on page 116 of the July 1953 issue of THE JOURNAL. Dr. Zander really pays me a compliment in attempting to associate my paper on "Pulp Reaction to the Insertion of Self-Curing Resin Filling Materials" with your editorial calling for more research on self-curing resins.

I can assure you that I did not regard my paper as the answer to your editorial. It was based on the clinical experiences of a large number of dentists. Dr. Zander cannot dismiss the findings of dentists in practice, even though such findings may be at variance with laboratory research. Their conclusions regarding self-curing acrylic fillings are borne out by the studies of G. H. Leatherman, an abstract of whose paper appears on page 123 of the same issue (July 1953) and who found that "acute pulp involvement occurred in about three per cent of the cases."

Louis I. Grossman, D.D.S., Philadelphia

EXPERIENCE WITH HYPNOSIS IN ARMY DENTAL CLINICS

During an 18-month period in Army dental clinics, I used the technic of psychosomatic sleep as a means of conditioning or attempting to condition 43 patients (enlisted personnel in the United States Army) for the performance of dental work. In order to indicate the possible importance of hypnosis to dentistry, I would like to discuss my observations, results and problems.

All 43 patients had some difficulty that indicated the need for psychosomatic dental treatment; most were referred by other dentists in Army clinics.

The subject usually had a deep-seated fear of dental treatment, often complicated by severe syncope, usually resulting from unfortunate experiences or unfounded rumors. Some patients had uncontrollable gagging reflexes and were referred by the prosthetic or radiology department. Still others had difficulties with local anesthetics and were referred by either the surgery or operative sections.

The results were classified into three categories. The first group, those patients who needed hypnosis and wished to have treatment continued after being conditioned, numbered 32. These 32 individuals were considered "successful cases."

The second group, individuals who were difficult to reinduct or who liked other anes-

thetics just as well, numbered 4. The third group, with whom hypnosis was a failure for some reason, numbered 7 patients.

The greatest problem to the hypnotist was interfering noise. The dental clinic provided little privacy for the operator and patient. Time was another problem. Most patients were inducted and had dental work performed during the same visit. Progressive conditioning was not possible for these dental patients.

In spite of the many difficulties, I consider hypnosis a valuable adjunct to the dentist's armamentarium. Some complications were loss of time, weariness from unsuccessful results and the embarrassment of being challenged by individuals who displayed lack of trust; however, the help and comfort obtained for those difficult patients who would have continued to be problems is sufficient gratification for the effort necessary to learn the technic of hypnosis and to continue its use.

Sumner D. Hirshberg, D.D.S., Quincy, Mass.

PULP REACTION STUDIES COMPARED

The article, "Pulp Reaction to the Insertion of Self-Curing Acrylic Resin Filling Materials," by Louis I. Grossman which appeared in the March 1953 issue of THE JOURNAL concerned work done at Montefiore Hospital by Seelig and Lefkowitz under my direct supervision; therefore, I feel that I should comment on a possible misconception of this work.

On page 265, paragraph 2 it is stated, "Their findings (Seelig, Lefkowitz and Zander) differ from the observations which a number of dentists made on their clinical experiences with acrylic resin fillings inserted in teeth of human beings." The foregoing statement is not in accord with the facts for the following reasons:

1. The studies were done entirely on animals, and therefore no analogy can be drawn to the subjective symptom of pain reported in the human.

2. The work of Seelig and Lefkowitz was a histological report, and no clinical report of dentists can find a comparison to these studies.

3. On page 377 of the first report of Seelig and Lefkowitz, appearing in the *New York State Dental Journal* in August-September 1949, we find the following: "The animals were sacrificed one, four and seven days after the insertion of the fillings."

Throughout the paper constant references are made to the time element so as to emphasize the fact that this study was undertaken to determine the immediate reaction of the acrylic on the pulp of the tooth when placed in the dentin.

I cannot understand Dr. Grossman's statements referring to the work of my associates in view of his reference to the second paper by Seelig and Lefkowitz published in the *New York State Dental Journal* in December 1951. Throughout this paper the authors stress the fact that they saw severe reactions with some of the brands of acrylics on the market at that time. We therefore must object to Dr. Grossman's blanket statement that they reported that all the acrylics are less irritating than zinc oxyphosphate cement. On page 553 they conclude, "It is impossible at this time to know the end result on pulps under these filling materials."

In "The Effect of Filling Materials upon the Pulp," which appeared in the October 1951 issue of the *New York Journal of Dentistry*, Dr. Seelig states, "There are many other factors that must be considered in the question of irritation to the pulp. A filling material may not irritate the pulp when placed on freshly cut dentin, but it might be the cause of subsequent irritation. The filling material might not seal the margins of the preparation . . ."

Upon rereading the latest article by Dr. Seelig, "The Effect of Direct Filling Resins on the Tooth Pulp," published in THE JOURNAL in March 1952, I find myself at a complete loss as to how this experimental work could be compared with clinical findings of dentists. Reviewing the previous work done, Dr. Seelig states that in the second study "It was shown that some plastics cause reactions in the pulp." He further states, "Despite the work done in this field, a great deal of confusion still exists and pulpal irritation caused by direct filling resins is still a problem."

I should like to conclude with one more published statement from the above paper: "The effect of the insertion of the material was tested in prepared cavities in animals' teeth, and it was found that the material itself produced no deleterious effect on the pulp [referring to improved products]. Therefore a study was undertaken to determine whether injury to the pulp might be caused by factors other than the toxicity of the material."

David Tanchester, D.D.S., New York City

Book Reviews

TEXTBOOK OF EXODONTIA

By Leo Winter. Revised by William F. Harrigan and Leo Winter, Jr. Sixth edition. 350 pages with 385 illustrations and one color plate. Index. Price $8. St. Louis, C. V. Mosby Company, 1953.

The revised edition of this well-known text on exodontics is essentially the same as the previous edition with the same illustrations. The chapter on general anesthesia has been deleted, and additional short chapters on chemotherapy and antibiotics, hemorrhage and diagnosis have been added.

The profuse illustrations make this book a very practical treatise of the subject and offer greater benefit than the text, which treats some subjects incompletely. The chapter on technic for the use of local anesthesia gives concise descriptions of the technical procedures and depends on good illustrations for anatomical information, while the chapter on accidents in local anesthesia might have been revised more carefully.

The thorough illustration of the instrumentation for the extraction of teeth and the most favorable position for the operator in applying the technics described is well done and can be studied with profit. The removal of impacted teeth and broken roots is also well presented. The student who peruses this book with care cannot fail to profit.

Charles W. Freeman

AN INTRODUCTION TO PUBLIC HEALTH

By Harry S. Mustard. Third edition. 315 pages. Index. Price $4.50. New York, The Macmillan Company, 1953.

As the title implies, this book is designed to orient the student in public health. It is purposely brief and does not concern itself with details of public health administration or offer suggestions for instruction in any of the specialized fields of public health practice. The material presented in this book can be found in most texts on public health. However, this author, by virtue of his long experience in public health practice and administration, has succeeded in presenting all the basic information on the subject in a small readable volume.

This revision, the third, was necessary because of the changes made in public health practice during the past decade. This includes new material on geriatrics, mental health and health education, among other subjects. As was the case with previous editions, this valuable little book will be found on the shelves of most public health workers and others interested in the subject.

Frank C. Cady

YOUR CHILD AND HIS PROBLEMS

By Joseph D. Teicher. 302 pages. Index. Price $3.75. Boston, Little, Brown & Company, 1953.

The range of topics in this book is extensive. It is designed to interpret the behavior of children under most circumstances. The author indicates that many parents who have the best information and the highest intentions have, unfortunately, unhealthy and unloving feelings about their children. Curiously enough they are unaware of these attitudes which affect the rearing of their children unfavorably. They seek help for problems inherent within themselves. Merely blaming them for poor rearing of their children is insufficient. They must be made aware of this negative attitude toward their children.

Children sense the emotional reactions of parents from birth. In fact, they know the parents better than the parents know them. That explains the advantage children have over their parents in coping with everyday problems.

The book presents all aspects of child life from birth to adolescence. It also stresses the emotional disorders accompanying childhood problems. The author's approach is reassurance without emotionality.

For parents to act as they feel can be harmful to the child. When a problem arises, a youngster welcomes reassurance in a casual manner setting limits to his behavior. For example, a child knows when his mother is frightened, but if she does not act frightened, he will not be so frightened. Whatever the behavior, it can be attenuated by parental love and by tender solicitude for the child. That bond of affection between parent and child enables a youngster to be educated and civilized in spite of parental mistakes. There are many compromises with children, but there can be no compromise with the fundamental principle of healthy emotional rearing.

I. Newton Kugelmass

FLUORIDATION OF MUNICIPAL WATER SUPPLY—A REVIEW OF THE SCIENTIFIC AND LEGAL ASPECTS

By Charles S. Rhyne and Eugene F. Mullin, Jr. 62 pages. Price $3. Washington, D. C., National Institute of Municipal Law Officers, 1952.

A concise treatise on the scientifically acceptable but emotionally controversial issue of fluoridation, this brochure will serve as an invaluable handbook for municipal authorities and citizens' committees in communities where adoption of the caries-preventive measure is being contemplated.

The authors briefly outline the history of fluoridation from early studies to recent findings and offer the conclusion that the public health measure is safe, effective, economical and definitely constitutional. In addition to the scientific and legal aspects, the technical problems receive attention, too. All aspects are supported by documented evidence, including such indisputable data as the results of legal actions. Other helpful guides include "An Act Concerning the Fluoridation of Public Water Supplies," prepared by the Connecticut Legislative Council, and ordinances enacted by various city councils authorizing the introduction of fluoride into the drinking water systems of their respective cities. A selected bibliography of some 40 references is also included.

Although the title and content might connote a heavy tome of the "required reading" type, any civic-minded individual will read the publication with interest—and satisfaction, if he is a proponent of fluoridation.

The National Institute of Municipal Law Officers is an organization comprising 700 member municipalities located in all 48 states, the District of Columbia, Hawaii, Puerto Rico and Alaska.

Marian Driscoll

HYPNOSIS IN MODERN MEDICINE

Edited by Jerome M. Schneck. 294 pages and index. Price $7.50. Springfield, Ill., Charles C Thomas, 1953.

Six physicians and one dentist have here related their experience in the use of hypnosis in their practices, which include internal medicine, obstetrics and gynecology, child psychiatry, anesthesia, psychology, surgery and dentistry.

The section on dentistry is contributed by Jules H. Weinstein, who outlines suggested practices of hypnosis, restrictions and possible use. The practice of hypnosis by the dentist has always been rare because hypnosis cannot be applied as a therapeutic agent. It does not replace any such agent or offer a medium which fulfills the needs of the patient and the practitioner.

The author recognizes that the practice of hypnosis is highly controversial but suggests that it "deserves a worthy place in the dental armamentarium." He advises dentists to limit its use to the rare and special cases, warning that "the medium must never become a crutch upon which the patient depends."

It is interesting to note that the term "hypnosis in dentistry" is used rather than "hypnodontia." Your reviewer believes that "hypnosis in dentistry" is the better term.

The book in itself is a review of hypnosis in modern medicine from the beginning of the 18th century to its present state. Those interested will find voluminous references at the end of each chapter and a good index.

Harry Strusser

HYPNOSIS IN DENTISTRY

By Aaron A. Moss. 292 pages with 62 illustrations. Index. Price $8.75. Brooklyn, Dental Items of Interest Publishing Company, 1952.

This book purports to explain the phenomenon of hypnosis, to give a brief history of its development and to describe technics for its application in dental practice. Many instances are described of hypnotic inductions by dentists, including the demonstrations of Thomas O. Burgess, out of which grew the American Society of Psychosomatic Dentistry in Minnesota and the Dakotas.

Some 200 years ago James Braid, a Scot practicing in England, coined the word hypnotism from the Greek word "hypnos" meaning "to sleep." To him goes the credit for establishing the fact that suggestion is the dynamic factor in producing hypnosis. Thus, according to Dr. Moss, the most dramatic form of suggestion is that seen in hypnotism. It consists, he says, "of the voluntary submission of the patient to a series of carefully controlled suggestions, whose purpose is to increase the suggestibility so that specific therapeutic suggestions may be accepted."

The successful use of hypnosis, the author states, depends on the use to which it is put. A high per cent of success can be achieved if hypnosis is applied for the purpose of relaxation and allaying of fears. Almost 90 per cent of patients, the author believes, are susceptible to a light state of hypnosis which would be required for the purpose. But this 90 per cent

of persons who are susceptible to a light stage of hypnosis may not need this treatment. It is safe to say that 90 per cent of persons who make up the average dentist's practice are cooperative and present no problem. With the whimpering 10 per cent, the chances for a successful hypnotic anesthesia would be much less, resulting in an element of uncertainty. With modern anesthesia this element of uncertainty would be eliminated—but, then, that's a different story.

Charles Frederick Harper

ZAHNÄRZTLICHE FORTBILDUNG. HEFT 8.
ZAHNÄRZTLICHE RÖNTGENDIAGNOSTIK

By Hans Heuser. 157 pages with 488 illustrations. Index. No price listed. Leipzig, Johann Ambrosius Barth Verlag, 1952.

This volume, the eighth in the "Dental Education" series, "provides a swift orientation for the dentist in the possibilities and limitations of roentgen diagnosis." Much of the space of the book is filled with exceptionally clear roentgenograms.

The author's main concern in the volume is to warn the dentist of the possibilities of making false diagnoses that lead to unnecessary extractions and futile attempts at correction of nonexistent abnormalities. Because of the vast scope of the subject of roentgenography, this volume is limited strictly to the interpretation of roentgenograms from the clinical point of view.

In the introduction, directions, supplemented with illustrations, are given for determining the proper plane and angle for taking the roentgenogram. The first chapter deals with false diagnoses based on normal anatomical variations which appear in roentgenograms and confuse the interpretation. Such anomalies include oral structures; deviations in the development of deciduous changing dentition; variations in teeth as to size, form, number, retention and persistence; and double formations.

Several chapters are devoted to difficulties in the interpretation of roentgenograms, including those of hidden proximal caries, the pulp and root canal system, periapical conditions, periodontal diseases, dental focal infection, diseases of the alveolar process and the jaw bones, inflammation of the alveolar fossa, disturbances of the temporomandibular joint and various types of oral tumors. For exact location of the specific area under discussion, arrows are used frequently within the roentgenograms.

In the final chapters, emphasis is placed on the importance of the adequate use of roentgenograms to assist the dentist in planning an operation, to provide control in the healing process and to evaluate the result. The author again warns that roentgenograms cannot be used to maximum advantage unless the dentist is on his guard against the possibilities of false interpretation.

The aim of the author, to provide practical information for the practicing dentist, seems to be achieved in this volume.

G. Nichols

ANATOMIE COMPARÉE CRANIO-FACIALE ET DENTAIRE

By M. Friant. 107 pages with 80 illustrations. Price not listed. Index. Paris, Julien Prélat, 1953.

This volume on craniofacial and dental comparative anatomy is written for the "nonspecialized reader." In the first chapter, the main characteristics of the jaws and teeth of the vertebrates are summarized. The second chapter is a detailed study of the cranium of the dog and that of man. In the third chapter, which is devoted to a comparison of the dental anatomy of mammals and of man, the main lines of dental evolution are traced briefly with special emphasis on the most complex aspect of the teeth of mammals, the direction of development of the molars.

From his study the author concludes: "From the most primitive fish . . . to man, an identical plan of organization is revealed in the skeleton of the cranium and of the face, in spite of the varied adaptations of the vertebrates."

The illustrations are exceptionally clear and abundant though by no means inclusive. It is obvious that a volume of this size on so broad a subject must of necessity be extremely condensed.

In his preface to the book, Dechaume declares that comparative anatomy should have its place in the dental training program and that this book "will find a large audience among students, specialists and all who are interested in these problems."

G. Nichols

Current Literature

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THE EFFECT OF PENICILLIN DENTIFRICE ON THE CONTROL OF DENTAL CARIES

Thomas J. Hill, John Sims and Millicent Newman, p. 448.

A study was conducted on the effect of a paste containing the procaine salt of penicillin on the control of dental caries. The children used in the experiment were from a public school, and the use of the dentifrice was regimented to the extent of one brushing each day. There were 347 in the experimental group and 145 in the control group, all within the ages of 7 to 12. At the end of one year's study the experimental group had 9.7 per cent less DMF teeth, 15.9 per cent less surfaces involved and 14.5 per cent less lesions than the control group. The data indicate that the use of the paste led to a slight reduction in dental caries but not of sufficient magnitude to conclude that a dentifrice used irregularly in an unregimented program would be of material value in the reduction of carious lesions. No significant changes in lactobacillus counts were observed. Allergies did not present a clinical problem.

THE DEVELOPMENT OF ORGANISMS WITH PENICILLIN RESISTANCE ASSOCIATED WITH THE USE OF A PENICILLIN DENTIFRICE

Thomas J. Hill, Cleo Rasch and Betty Wollpert, p. 453.

The salivas from 100 children who had used a penicillin dentifrice for one year and from 50 children who had not used a penicillin dentifrice were tested for the presence of organisms that had become resistant to the antibiotic. In all, there were 814 cultures included in the report. It was observed that the continuous use of penicillin increases the percentage of *Streptococcus viridans*, which requires .05 unit of penicillin or more to inhibit. It was also observed that there were similar increases in other organisms which required concentrations of 1.0 unit or more of penicillin to inhibit. Not only was there a greater total number of penicillin-resistant organisms in the salivas of penicillin users but there was also a greater percentage of individuals having resistant organisms among the constant users of this antibiotic.

THE EFFECT OF SODIUM FLUORIDE APPLICATION ON THE DENTAL CARIES EXPERIENCE IN ADULTS

Benton Kutler and Ralph L. Ireland, p. 458.

One hundred and forty-seven medical students, 20 to 42 years of age (median age 24 years), had two quadrants in their mouths treated with a 2 per cent solution of sodium fluoride. Fifty per cent of the students received treatments on the right quadrants and the other 50 per cent on the left quadrants. The teeth in the opposite quadrants in each case served as controls. The method advocated by Knutson and Armstrong for applying the sodium fluoride solution was used. Clinical and roentgenographic examinations were made of the teeth before the last sodium fluoride treatment was given and again approximately 13.5 months later. The same examiner made both examinations.

Examination of new caries in 294 treated quadrants and 294 nontreated quadrants showed no significant difference in dental caries incidence.

On the basis of total new caries, or on the basis of results for each individual, there was no significant reduction in dental caries incidence.

A PROCEDURE FOR THE ROUTINE DETERMINATION OF FLUORINE IN POTABLE WATERS CONTAINING IRON, MANGANESE, ALUMINUM, AND CHLORINE

James F. Grutsch, William H. Nebergall, Joseph C. Muhler, Robert B. Fischer and Harry G. Day, p. 463.

The Sanchis-Scott method for the determination of fluoride in potable waters has been

modified to permit accurate analysis for fluoride in the presence of iron, manganese, aluminum and chlorine, substances which interfere in the unmodified Sanchis-Scott method. The modification involves a preliminary treatment in which the water sample is analyzed for fluoride by the conventional Sanchis-Scott method with thioglycolic acid. Ferric iron, manganic manganese and elementary chlorine are reduced to ferrous iron, manganous manganese and chloride ion, respectively, by thioglycolic acid. In the reduced condition, these elements do not interfere with the determination of fluoride by the conventional method. The fact that the interference of aluminum in the Sanchis-Scott method of fluoride analysis decreases with decreasing concentrations of the aluminum ion makes it possible to determine the fluoride accurately by the proper dilution of the sample taken for analysis.

EFFECT OF CERTAIN CONCENTRATIONS OF FLUORIDE ON ENAMEL AND DENTIN AS FORMED IN TRANSPLANTS OF TOOTH GERMS AND RELATED STUDIES

Harold S. Fleming, p. 469.

Transplants of tooth germs failed to grow and develop as expected when the hosts received certain concentrations of sodium fluoride or of calcium fluoride either orally or by interperitoneal injection. Sodium fluoride or calcium fluoride, reagent grade, diluted to 1:50,000 or 1:75,000 was given via drinking water, and 1:1,000 dilutions were used for injections. These concentrations of fluorides did not seem to affect the hosts except as indicated.

Animals as compared with controls retained normal weight curves and did not appear sick. Retardation of mineralization or of calcification of tooth germ transplants was evident when fluorides had been given to the hosts. Significantly, expected revision of dentin into osteoidlike tissue did not take place when fluorides had been given over longer periods. Instead, cartilagelike formations were frequently observed in association with dentin as formed in these transplants. Both calcium fluoride and sodium fluoride appeared to have a similar effect on these transplants.

Daily injections of calcium fluoride (3/20 cc. of a 1:1,000 dilution) were given to Norwegian white rats, and the effect on the ameloblasts and the odontoblasts of the incisor teeth (mandibular) was observed. Among other changes there was alteration in the cuticular structure of the ameloblasts when fluorides had been administered. Expected keratinous formations, generally observed when tooth germs were treated with methylcholanthrene before transplantation, were lacking when the hosts had been given fluorides. An increased number of lymphocytes appeared near transplants when fluorides had been administered. Animals receiving fluorides appeared more fertile.

A NEW APPROACH TO THE PROBLEM OF DENTAL CARIES CONTROL

L. S. Fosdick, J. C. Calandra, R. Q. Blackwell and J. H. Burrill, p. 486.

SODIUM AND POTASSIUM AS CONSTITUENTS OF HUMAN SALIVARY BUFFERS

Samuel Dreizen, Ann I. Reed, William Niedermeier and Tom D. Spies, p. 497.

The buffer capacity of stimulated saliva is considerably greater than that of resting saliva in the same person. In the series of samples obtained from 80 consecutive patients, the increases in the buffering power of stimulated saliva as contrasted to that of resting saliva ranged from 27 per cent to 400 per cent, with a mean of 150 per cent. The magnitude of difference was, in general, related to the rate of flow. The difference in the buffer capacity of resting and stimulated saliva in the same person is related to the sodium and bicarbonate concentration.

Whereas potassium is the predominant cation in the buffer systems of resting saliva, sodium predominates in stimulated saliva. Of the anions contributing to the salivary buffers, phosphates and proteins decrease in concentration and bicarbonates increase in concentration when the salivary glands are activated by the masticatory process.

In 22 of 25 cases studied, the total increase in sodium and bicarbonate concentration of stimulated saliva was considerably greater than the total change in potassium, phosphate and protein concentration. The greater buffer power of stimulated saliva as contrasted with that of resting saliva in the same person is due to the increase in the quantity of sodium and bicarbonate elaborated by the salivary glands in response to stimulation.

INHIBITORS IN RELATION TO SALIVARY AMYLASE ACTIVITY: QUININE AND URETHANE

Leon H. Schneyer, p. 504.

LEUKOCYTES IN THE SALIVA OF CARIES-FREE AND CARIES-ACTIVE SUBJECTS

Donald E. Wright and G. Neil Jenkins, p. 511.

Specimens of saliva were obtained from 11 caries-free and 16 caries-active subjects, either as "spontaneous samples" or as wax-stimulated samples. The stimulated saliva was collected for five minute periods with and without preceding periods of two minutes' duration of toothbrushing and mouth rinsing.

After thorough mixing, all specimens were examined on a hemacytometer slide under the phase-contrast microscope.

For the purpose of the experiment the leukocytes were divided into two groups: (1) those in well-preserved condition, referred to as "intact" cells, and (2) those in varying stages of disintegration. The cells in both these groups were classed together as "total" leukocytes; counts were made of "intact" and "total" cells. The number of "intact" leukocytes was four times greater in the samples from caries-free subjects than in those from caries-active subjects; the number of "total" leukocytes was similar in the two groups.

A check on the periodontal condition of the subject was obtained in terms of the PMA index of Massler, Schour and Chopra; a comparison showed that there was no difference in the state of gingivitis between the caries-free and the caries-active groups. Relative differences in the inflammatory state of the gingivae therefore do not explain these observations. It is not yet known whether this higher percentage of "intact" cells in caries-free saliva is caused by an increase in number of cells entering the saliva or by a slower rate of disintegration. The relation to any reduced bacterial activity in the caries-free mouth also is problematical. Further experiments investigating these points are in progress.

GERMICIDAL ACTION OF CEYTL PYRIDINIUM CHLORIDE ON BETA HEMOLYTIC STREPTOCOCCI

Thomas C. Grubb and Hoyland A. Wands, p. 524.

The extremely rapid germicidal action of the quaternary ammonium antiseptics is demonstrated in this study by the fact that 31 strains of freshly isolated beta-hemolytic streptococci were killed after 10 to 15 seconds' contact with 0.025 per cent cetyl pyridinium chloride in water, in 15 per cent alcohol or in a mouthwash. When 10 per cent sterile saliva was added to the antiseptic solutions, it did not affect the speed of germicidal action in 82 per cent of 331 tests; in the remainder of the tests activity was increased or decreased.

THE EFFECT OF SODIUM PARA-AMINO SALICYLATE AS A GROWTH FACTOR FOR LACTOBACILLI

J. L. Maxwell, F. R. Dunning and M. P. Newman, p. 528.

Para-aminosalicylic acid is administered orally in conjunction with streptomycin in the treatment of tuberculosis. It was thought that because of the similarity of the structural formula of this chemical to that of para-aminobenzoic acid microorganisms might utilize it as a growth stimulant. In growths of pure cultures of *Lactobacillus casei* and *Escherichia coli*, no stimulation of growth was observed in dilutions of 2, 4, 6 and 10 mg. per milliliter, and there was no significant increase in glycolysis as measured in the Warburg respirometer. It was concluded that this chemical is not an important factor in the stimulation of glycolysis associated with dental caries.

THE ESTIMATION OF SAMPLE SIZE IN EXPERIMENTS. I. USING COMPARISONS OF AVERAGES

Neal W. Chilton and John W. Fertig, p. 530.

In order to estimate the size of samples necessary for statistical significance, the investigator must have information as to the type of result considered important and a certain amount of preliminary data. The tables presented here illustrate the organization of preliminary data; there are various methods of studying, analyzing and comparing the averages for both independent and correlated samples. Methods, involving the use of formulas based on the t-curve and the normal curve probability values, may be used to estimate the size of samples necessary for an assertion of significance for statistical results.

CLINICAL COMPARISON AND EVALUATION OF SPECIFIC XYLOCAINE HYDROCHLORIDE AND PROCAINE HYDROCHLORIDE SOLUTIONS IN MANDIBULAR BLOCK ANESTHESIA

Henry B. Black, p. 541.

In this investigation the clinical value in inferior alveolar nerve block injection of a

solution containing 2 per cent procaine hydrochloride, 1:40,000 epinephrine, (146 cases) was compared with the clinical value of a solution containing 2 per cent Xylocaine hydrochloride, 1:100,000 epinephrine, (154 cases).

The following conclusions were drawn after a statistical evaluation of the data:

1. The mean onset and surgical stage times are significantly shorter for the Xylocaine solution than for the procaine solution.
2. The mean duration time is significantly longer for the Xylocaine solution than for the procaine solution.
3. The Xylocaine solution causes significantly less change in the pulse rate three minutes after injection than does the procaine solution.
4. There is no significant change between the mean pulse rate before injection and the mean pulse rate 15 minutes after injection for either of the solutions.
5. Evidence indicates a slight tendency toward more hemorrhage when the procaine solution is used than when the Xylocaine solution is used.
6. There is no significant difference in the number of subjective reactions of the two groups.
7. There is no significant difference in the anesthetic efficiency of the two solutions for this particular injection.

AN ELECTRONIC TECHNIC FOR RECORDING THE MYODYNAMIC FORCES OF THE LIP, CHEEK, AND TONGUE

James P. Alderisio and Roy Lahr, p. 548.

LOWER FIRST PREMOLARS. PART I. A DEFINITION AND CLASSIFICATION OF DISCRETE MORPHOLOGIC TRAITS

Bertram S. Kraus and Montie L. Furr, p. 554.

The hereditary basis of the dentition has long been recognized. Hitherto, with one exception, genetic analysis has been confined to rare, pathological or nonmorphological dental traits. One reason for this situation is the failure to observe, classify and isolate the numerous morphologic variations in the structure of the enamel crown. Such studies are necessary preliminary steps to genetic analysis and racial classification of dental traits.

In this study the crown structural variations in over 800 lower first bicuspids from several ethnic groups (Papago, Yaqui, Mexican, Negro, Caucasian, Chinese and prehistoric Indian) were analyzed and classified. Both dental casts and extracted teeth were used. Seventeen traits of the lower first bicuspids were isolated and defined. Each trait had two or more variant forms.

Previous studies of the lower first bicuspids have failed to indicate the wide range of variability in the surface structures of the crown. Each of the 17 traits here defined is heritable, and each acts as an independent variable.

PRENATAL INFLUENCES ON TOOTH DEVELOPMENT. II. ARTIFICIALLY INDUCED FEVER IN RATS

Seymour J. Kreshover and O. Wendell Clough, p. 565.

A SYSTEM FOR RECORDING ORAL CONDITIONS AND DENTAL LESIONS IN THE LIVE SYRIAN HAMSTER

Erling Johansen, p. 578.

A series of charts may be used for the progressive recording of eruption and attrition of the dentition, dental caries and the different phases of periodontal disease. The recording of the accumulation of supragingival and subgingival deposits on composites of these charts provides a basis for the study of various correlations. The use of colored pencils, a different color for each examination, greatly facilitates the recording and differentiation of successive observations on the charts.

THE AMINO ACID COMPOSITION OF ENAMEL PROTEIN

W. C. Hess, C. Y. Lee and B. A. Neidig, p. 585.

Of the 20 known amino acids, all except hydroxylysine have been found in normal human enamel eukeratin. The 19 amino acids have been determined quantitatively; their nitrogen content accounts for 97.9 per cent of the total nitrogen of the protein.

THE SKIN OF YOUR TEETH

R. F. Sognnaes. Scientific American 188:6 June 1953.

Results of recent studies on the chemical content of enamel were as follows: Radioactive tracers show the turnover of the "atomic build-

ing blocks" in the enamel. Some of the ions at the surface of the enamel crystals, including ions of phosphorus and calcium, are freely exchangeable with chemically similar ions in the surrounding fluid, the saliva. Chemically, the saliva has the same role in finished enamel that tissue fluid has in finished bone.

These findings are significant in the prevention of dental caries though the caries puzzle is far from solution.

Heyl G. Tebo

AN ESSENTIALLY PRACTICAL APPROACH TO PULP CAPPING AND PULPOTOMY

W. D. Suthers. D. J. Australia 25:233 Dec. 1952.

The most common cause of exposure of the dental pulp is caries. Other common causes are traumatic injury to the tooth and accidental exposure during cavity preparation. These exposures may be treated by pulp capping and pulpotomy with the success of the treatment depending on the recuperative powers of the pulp tissue and the formation of a "dentin bridge."

The preferred capping material is calcium hydroxide or a material with a calcium hydroxide base. The preferred sterilizing and hemostatic agent, used after exposure of the pulp, is a concentrated solution of calcium hydroxide. A 2 to 3 per cent solution of Calxyl also is effective. These agents are recommended on the basis that they are nonirritating to the pulp tissue. Paraffin wax, a neutral varnish or a creamy mix of zinc oxide and eugenol is used for insulation between the pulp cap and the cement base.

The processes of pulp capping and pulpotomy consist of a number of step by step procedures. The use of the rubber dam is important to ensure sterilization. The criteria of success for pulp capping include (1) history of pain, (2) tenderness to percussion, (3) response to the electric pulp tester, (4) periapical findings, (5) deposition of secondary dentin. The criteria of success for pulpotomy include (1) history of pain, (2) tenderness to percussion, (3) continued root formation in permanent teeth, (4) continued root resorption in deciduous teeth, (5) deposition of secondary dentin.

Factors governing the selection of cases for which these procedures are to be used include (1) sensitivity of the pulp and reaction to vitality tests, (2) hemorrage of pulp at the point of exposure, (3) absence of periapical area of rarefaction in the roentgenogram, (4) negative history of chronic disease, (5) negative history of intense prolonged pain in the tooth involved, (6) for a deciduous tooth, time of exfoliation and expected period of service, (7) condition of other teeth, caries susceptibility, and determination as to whether preservation of the tooth is warranted.

Pulp capping should be limited to exposures of instrumental origin; the pulpotomy operation should be used for other cases; however, several pulpotomies in the same mouth should be avoided.

Pulpotomy, in particular, is indicated when: (1) there is extensive exposure of the pulp, (2) extensive hemorrhage occurs, (3) the pulp is exposed for longer than a 24 hour period, (4) the root end is in the process of development.

R. J. Shankle

SOME OBSERVATIONS CONCERNING CHROME-COBALT DENTURE BASES

J. Osborne and G. A. Lammie. Brit. D.J. 94:55 Feb. 3, 1953.

Since the first dental casting with the chrome-cobalt alloys by Krupps prior to 1929 their use has become extensive. They became available in Britain in 1950.

Generally, the chrome-cobalt alloys contain chromium 30 per cent, cobalt or in some cases nickel 60 per cent, molybdenum up to 5 per cent, carbon from 0.4 to 0.15 per cent. Other elements that may be present are tungsten, manganese, silicon, aluminum and columbium.

Since the melting point of the chrome-cobalt alloys (1,280°C.-1,425°C.) is much higher than that of gold (900°C.-970°C.), a hot fast flame such as that of oxyacetylene is indicated for quick heating to prevent oxidation. On account of their greater hardness the chrome-cobalt alloys keep their polish and surface finish better than gold; on account of their low specific gravity, about half that of gold, they are light in weight. In respect to tensile strength, the frequency of fracture for clasps of chrome alloys is a little higher than for clasps of yellow gold but much less than for clasps of white casting golds. The modulus of elasticity of chrome alloys is higher than that of gold; therefore thinner clasps are used and they engage less undercut. The design of the clasps should be such as to prevent too much lateral force, since the clasp arms give less.

Special materials and apparatus are necessary for the technic in which chrome alloys are used. A high temperature investment of silica with a binder component and a high temperature fusion casting ring lined with two thicknesses of asbestos or a split ring are

used. The heating apparatus must be a muffle furnace, preferably gas, to give a mold temperature of 1,100°C. A multi-coned torch with a slight carburizing flame for melting the alloy is desirable. A vertical centrifugal casting machine which produces a maximum high initial acceleration is recommended. Sand blasting equipment and a high speed polishing motor or a compressed air grinder are indicated for polishing the alloy.

The authors have used the chrome-cobalt alloys in four types of appliances: (1) denture bases in full upper dentures, (2) spoon denture bases, a type of claspless palatal denture replacing one or more anterior teeth, (3) skeleton frameworks for partial dentures, incorporating wherever possible such clasp designs as the Roach, back action, reverse back action, modified ring and extended arm varieties, (4) bite-raising appliances.

The response of patients supplied with chrome-cobalt alloy dentures was favorable, and the tissue reactions were generally good. A few patients complained of a metallic taste, which disappeared after a few days. The patients found the dentures pleasant to wear and light in weight as compared with those made of gold. The surface finish of the alloy was well maintained wherever a good polish was present when the denture was inserted.

H. O. Beck

A REAPPRAISAL OF LABIOLINGUAL THERAPY

Oren A. Oliver and William H. Oliver. Am. J. Orthodont. 39:109 Feb. 1953.

When properly used and fabricated, the labiolingual appliance can meet practically all the classic standards of the ideal appliance. These appliances are stable and durable. They can be constructed with comparative ease, they are readily placed in the mouth and are manipulated smoothly and simply. They are easy on the patient and on the operator. There is a minimum amount of time necessary to adjust them. They are clean and as comfortable as appliances in the mouth can be. They are probably the least conspicuous of appliances used in present-day orthodontics. Most important of all, the labiolingual technic is efficient. These features result in reduced cost for orthodontic service and make orthodontic treatment possible for more patients.

There are certainly many other excellent types of appliances. Nearly all of them are similar in design and function, although unfortunately diverse claims and statements have been made to favor or discredit each in turn. This confusion of claims is certainly not desirable in a profession such as orthodontics. Actually, nearly every so-called appliance employs a labial arch of some sort.

The lingual arch appliance is used in nearly all technics in one form or another, whether it be soldered or removable, solid or tubular, one piece or sectional, made of wire or acrylic resin.

Best results with the greatest regard for anchorage and reinforcement of anchorage can be gained by using the labial and lingual arch appliances at the same time. The lingual arch appliance is usually used for control and movement of units in the posterior segments of the arch and the labial arch for manipulation or movement of dental units in the anterior portion of the arch.

Auxiliary springs with very gentle pressures may be used for controlled movement such as expansion or individual tooth movement, for rotation or protrusion. One of the chief auxiliaries in the labiolingual technic is the occlusal guide plane.

Results obtained from the judicious, practical application of the labiolingual appliances are equal or superior to those obtained with any other appliance. Orthodontics in its second half century as an organized branch of dentistry has a definite place for the labiolingual technic.

William F. Ford

CONGENITAL ABSENCE OF THE RAMUS OF THE MANDIBLE

Harold I. Harris. Am. J. Surg. 85:600 May 1953.

In case of congenital absence of the ramus of the mandible, reconstruction by bone transplantation presents many difficulties; but it has been done, the main objective being to improve the contour of the affected side of the face. A bone transplant, however, does not keep pace with the growth of the child, and soon there is again a disproportion between the two sides. The associated soft tissue defects in all cases should be treated at an early age and not delayed. Bone grafting has been delayed until after the twelfth year or longer in cases reported in the past.

In two cases interval grafting of a homologous cartilage or bone is being done about every two years. Thus a gradual increase in the space between the temporal fossa and the body of the mandible is produced over a period of time and prevents too great a shortening of the affected side and displacement of the mandible. After the mandible has developed fully, there is a tunnel of sufficient size to insert an autogenous bone graft. Dur-

ing this time the soft tissues should have shown a cosmetic improvement. This form of treatment should be instituted early in life. In these two cases it was started at three and six years of age respectively.

C. Dean Couch, Jr.

EXPERIMENTAL SUBPERIOSTEAL DENTAL IMPLANTS

Roy L. Bodine, Jr., and Raymond L. Kotch. U. S. Armed Forces M.J. 4:441 March 1953.

Although dental implants must be regarded as experimental, the implant denture offers new hope for patients with maxillofacial injuries that make conventional dentures impossible.

A histological study by Philip Loechler shows that the crevice around an implant abutment is a normal gingival crevice lined with squamous epithelium and connective tissue, which occupies only one-third the length of the post, is shallower than the gingival crevice around a natural tooth and contains fewer inflammatory cells. Loechler concludes that there is no leakage around the abutments if the procedure is performed properly.

One of the four cases presented in this article was treated by Killebrew's method. Measurements of the thickness of the mucosa were taken, and an attempt was made to remove the exact thickness of material from the working cast on which the implant was constructed. When the mucoperiosteum was lifted and the implant seated, close adaptation was lacking at several points. The spiny ridges were removed, and the casting was readapted to permit the best possible fit and then secured with a small screw on each side. Healing was protracted, tenderness occurred in the area of one abutment or another, but the patient was pleased with the result.

The technic used for the second case consists of two operations. This technic was first described by Berman and is now generally accepted. In the first operation the mandible was exposed, and a surgical impression was taken. Then the meshwork was constructed on the resultant cast. In the second operation two weeks later the implant was placed. The meshwork fitted the bone accurately. Two retention screws were used only as a precautionary measure. There was no tenderness in the abutments. The superstructure was inserted four weeks later and resulted in improved mastication.

In two other cases single tooth implants were retained entirely by the meshwork with no screws. The results were satisfactory.

The implant impression is not started until a conventional upper impression and lower impression have been carried to an acceptable try-in stage. The implant impression is taken with an acrylic tray lined with compound; it must include all the exposed bone and must extend over the contour of the mandible buccally and lingually in order to resist lateral stresses. The insertion of the meshwork implant is performed two or three weeks after the implant impression has been taken; the same line of incision is followed. Elevation of the periosteum is relatively easy, because it has not become reattached firmly to the bone since the first operation. The superstructure consists of a framework with clasps or a precision female capping joined by rigid connectors, which must be high enough to clear the healed tissue and still not interfere with tooth placement. Acrylic, porcelain or metal teeth of any kind may be used.

Monte G. Miska

RADIUM IN THE TREATMENT OF CANCER OF THE TONGUE

Theodore P. Eberhard. Am. J. Roentgenol. 69:789 May 1953.

The place of interstitial radium therapy in the treatment of cancer of the tongue is apparently being challenged again by both surgeons and roentgen-ray enthusiasts. Surgery will need to show a statistically significant improvement in rate of survival for patients so treated compared with that for patients treated with irradiation before the resulting loss of function can be justified. Everyone admits that conventional external irradiation is not effective; however, certain groups have been using roentgen therapy units in the 700 to 2,000 kv. range with some impressive results although on persistent remnants it has been necessary to use electrocoagulation in almost every case.

Treatment as radical as interstitial needle implantation is not begun without confirmation of the diagnosis by biopsy. Roentgen-ray irradiation is a much less drastic procedure which can be started at once and carried on until the diagnosis is established. During this period the lesion becomes cleaner, and the subsidence of edema often reveals the limits of the lesion with considerably greater clarity. During this period the lesion can be studied and the radium therapy planned with care. Furthermore, the devitalizing effect of this irradiation probably reduces the ability of cells dislodged during the implantation to survive and grow in remote locations.

The optimum linear intensities of 1 to 2 mg. per cm. are safer as well as more effica-

cious. Causes of failure in treatment with interstitial radium are: (1) in the technic of inserting the radium needles, underestimation of the depth of the lesion and the use of needles which are too short, (2) lack of appreciation of the structure and motion of the tongue, and (3) poor anesthesia, poor lighting and insufficient relaxation on the part of the operator and the patient.

C. Dean Couch, Jr.

WHAT TO TELL THE PATIENT WITH PERSISTENT CANCER

Howard R. Bierman. Arch. Surg. 66:584 May 1953.

The decision as to whether or not to tell the patient that he has persistent cancer is subject to the circumstances. To tell or not to tell is not really the question. The manner in which the information is given is of more importance than the information itself.

It is preferable to have both husband and wife together at all such conferences and to introduce early and then continue the husband-wife theme throughout: When one marries, the vows include "in sickness and in health; for better or for worse." The presence of cancer in one spouse is a problem for both and should be so stated. If the patient is told of the seriousness of his disease in the presence of his spouse and the doctor, he realizes that he is not in the battle alone or unaided.

When a patient is told that he has cancer and that the prognosis is poor, it is not necessary to pull all the props from underneath him. One must allow him a few straws of hope; if there are none, it is up to the doctor to create one. It matters little about the validity of "the straw." What matters more is the creation of hope and confidence in the future. It is the encouragement and the desire to live on the foundation of this hope that permit the patient to go on and be a credit to his close friends as well as to himself.

C. Dean Couch, Jr.

METASTATIC CARCINOMA OF THE MANDIBLE

Nolton H. Bigelow and Thomas S. Walsh. Ann. Surg. 137:138 Jan. 1953.

Metastatic carcinoma of the mandible is a rare and unusual lesion. A few such secondary growths in the lower jaw have originated from carcinoma of the breast, thyroid, lung, prostate, kidney and gastrointestinal tract; neoplasms of this type have a special predilection for bone.

Early symptoms often comprise paresthesias or pain over the distribution of the mandibular nerve, due either to pressure on or involvement of this nerve. Occasionally pain in association with the loosening of a tooth develops; and not infrequently the patient is seen first by a dentist, who extracts the tooth. The development of an obvious swelling at the site of extraction generally occurs later.

Since the mandible is readily accessible for clinical study, the scarcity of reports concerning metastases to this site probably reflects the rarity of this lesion. It has long been known that it is extremely difficult to distinguish primary from secondary malignant tumors in the jaw. If a patient is known to have had a malignant tumor, there is a possibility that mandibular metastasis may occur some years later.

It has long been recognized as a puzzling phenomenon that carcinoma of the breast has an apparent affinity for the development of osseous metastases at some sites while other regions seem rarely involved. As is well known, metastases from breast carcinoma may occur both by way of the blood stream or lymphatics, but osseous metastases apparently occur most often as a result of vascular metastases. Furthermore, such metastases usually develop first within red active marrow and do not often occur in fatty marrow, presumably because the scanty vascular channels in the latter do not permit ready dissemination and growth of tumor emboli. Since the marrow of the adult mandible is predominantly yellow, with no red marrow at all in approximately 75 per cent of cases, it is not surprising that metastases do not often develop in this structure or indeed in other bones, such as the phalanges, which have predominantly yellow marrow.

In one case carcinoma of the breast led to the development of a localized metastasis to the jaw four years after mastectomy.

Myron Kaufman

HAIRY TONGUE

Francesco Ronchese and Arthur B. Kern. Arch. Dermat. & Syph. 67:503 May 1953.

Hairy tongue is a benign disease entity of somewhat bizarre nature. Characterized by an overgrowth of the epidermis of the filiform papillae, particularly in the triangular area anterior to the circumvallate papillae, the filamentous proliferation produces an appearance which has been likened to "the hair of a dog dampened by water." The color is frequently black, but shades of brown, yellow, blue and green have been noted. In most instances the condition is asymptomatic; the

patient complains only of the appearance of the tongue.

There has been considerable controversy over the etiology of the disease. In one case, the condition developed after the use of aureomycin. It is questioned whether aureomycin was actually the responsible agent, although the available evidence suggested the cause-and-effect relationship. There was no other obvious cause; the patient denied having used mouthwashes, astringents and irritants and stated that he was only a light smoker. The pigmentation of the tongue developed shortly after the application of aureomycin ointment to the lip and disappeared from most of the tongue after the use of the ointment was discontinued; the patient obviously had transferred the ointment to his tongue on licking his lip.

The mode of action was not clear. As has been proposed by previous authors, it is possible that the antibiotic suppressed the normal bacterial flora, thereby allowing multiplication of other microorganisms, such as candida. The isolation of this fungus and the response to fungicidal therapy suggested that this organism may have played some role in development of the hairy tongue.

C. Dean Couch, Jr.

CHLORAMPHENICOL IN TREATMENT OF PRIMARY HERPETIC STOMATITIS AND HERPES LABIALIS

Edward V. Zegarelli. Arch. Dermat. & Syph. 67:563 June 1953.

Since chloramphenicol has one of the widest antiviral spectrums of the available antibiotics, systemic chloramphenicol therapy was employed to treat acute primary herpetic stomatitis and herpes labialis. Cases from all age groups were treated with chloramphenicol; other cases were used as controls. Acute primary herpetic stomatitis and herpes labialis were relatively unchanged by chloramphenicol therapy. The incidence and severity of superimposed secondary infection may have been decreased.

K. Tessler

PRE-OPERATIVE PROCEDURES AND POST-OPERATIVE EXPEDIENTS IN PERIODONTAL SURGERY

Raoul Blanquie. J. Periodont. 24:167 July 1953.

The procedures in preliminary care and attention to the tissues were compared with the results of postoperative periodontal surgery, and the following conclusions were drawn: (1) Periodontal surgery should be preceded by adequate measures to arrest inflammation and infection of the periodontal tissues. (2) The purpose of these measures is to reduce bleeding and postoperative discomfort, to avoid the return of pockets, to shorten the healing period and to prevent bacteremia with its systemic consequences. (3) The prerequisite measures are medication, subgingival curettage and the relief of traumatic stresses and interferences, especially on loose teeth. (4) The addition of certain ingredients to the surgical dressing may enhance its utility as regards its stability in position and its sedative and hemostatic properties. (5) The use of sodium hydroxide and calcium oxide, with proper precautions, may be indicated for advanced intraosseous lesions and for resurgent pockets in both periodontitis and periodontosis. (6) Porte-polishing and taping should be part of routine procedure after all types of periodontal treatment and prophylactic checkups.

CLINICAL MANIFESTATIONS OF PERIODONTAL DISTURBANCES REQUIRING TREATMENT

Edgar D. Coolidge. J. Periodont. 24:143 July 1953.

The types of periodontal disease may be divided into those conditions in which chronic inflammation is the principal cause of the disturbance and those in which the predisposing factors lead to tissue degeneration and loss of function. The inflammatory conditions occur in chronic gingivitis, including gingival hyperplasia and periodontitis. Periodontitis complex is a combination of the inflammatory condition and the degenerative condition occurring at the same time or becoming superimposed one on the other during the progress of the disease.

The following general statements may be made: Periodontosis probably starts with the degeneration of some part of the periodontal tissue. The vitality of the cementoblasts seems to lessen, and new deposits of cementum fail to be laid down. Periodontal fibers become separated, and the affected tissue fibers lose their function and disappear. The loss of functional stimulation, followed by loss of alveolar bone, may be the result of a disturbance or deficiency of nutrition or of some toxic influence commonly observed in gastrointestinal disorders, degenerative and infectious diseases, endocrine imbalance, blood dyscrasia, avitaminosis or mineral starvation. With a predisposing weakness in the periodontium

brought about by heredity, by some nutritional deficiency or by metabolic disturbance, the process of tissue repair breaks down, and degeneration occurs.

The objective of treatment is to determine and correct the cause of the disease, to reduce gingival pockets to a minimum and to restore health and vigor to the periodontal structures. Conservative methods of treatment, including meticulous scaling, control of infection and intensive home care, are recommended. Medication, nutritional instruction and occlusal adjustment should be given as indicated. Pocket elimination by gum resection should be employed when the desired result has not been attained, because pockets will deepen progressively if they are not eliminated. Sometimes a local disturbance in the gingiva can be corrected by treating the systemic factor as, for example, in the treatment of gingivitis by administration of ascorbic acid when there is evidence of a low blood level of vitamin C. No periodontal pocket can be cured, however, by treating a systemic predisposing factor without local treatment for the pocket.

EVALUATION OF TRICHLOROETHYLENE AS AN ANESTHETIC AND ANALGESIC AGENT

W. K. Nowill, C. R. Stephen and P. W. Searles. Arch. Surg. 66:35 Jan. 1953.

An attempt has been made to analyze the drug trichloroethylene from the standpoint of possible abnormalities in physiology induced by this drug and its clinical usefulness in 1,032 patients. Experimental animals also were utilized in this study. The following conclusions were reached:

1. Trichloroethylene produces no apparent adverse effect on renal or hepatic function or structure.

2. In vapor concentrations below 0.5 per cent, trichloroethylene produces little or no abnormality in cardiac rhythmicity, while in concentrations above 0.5 per cent, cardiac arrhythmias consisting of unifocal and multifocal ventricular extrasystoles, bigeminal and nodal rhythms and simple sinus bradycardias may be produced. These arrhythmias are infrequently apparent clinically and only occasionally produce a decrease in systemic blood pressure. Among the 1,032 patients, there were no deaths during anesthesia and in the postanesthetic state none which were related to the drug. While these arrhythmias resemble those which occur with the use of chloroform and cyclopropane, no instance of serious cardiac dysfunction has been noted. Safe levels of trichloroethylene appear to be 0.5 per cent vapor concentration or less. With these levels, tachypnea, which is a definite indication of excessive trichloroethylene vapor concentration, is not produced.

3. Trichloroethylene does not appear to induce either respiratory or metabolic acidosis.

4. Trichloroethylene appears to increase cerebral blood flow moderately.

5. Analgesia with trichloroethylene-air for short painful procedures appears to be satisfactory. Combined with nitrous oxide-oxygen, trichloroethylene appears to produce successful light general anesthesia.

6. As a supplemental agent, trichloroethylene may be combined successfully with the thiobarbiturates, nitrous oxide and muscle-relaxant drugs.

7. Trichloroethylene is an analgesic agent and should be used for that purpose. To use it as a primary anesthetic drug will result in vapor concentrations and therefore blood concentrations which are dangerous. It should be utilized to produce analgesia in a conscious patient or to supplement other anesthetic drugs.

Myron Kaufman

INDICATIONS FOR RECONSTRUCTION AT THE TIME OF SURGICAL EXCISION OF CANCER OF THE ORAL CAVITY

Herbert Conway and Joseph E. Murray. Cancer 6:46 Jan. 1953.

Case records support the contention that in the surgical management of intraoral carcinoma it is correct and feasible to initiate the steps of reconstructive surgery at the time of the radical excisional surgery.

Experience indicates that it is never justifiable to attempt to save the mandible if the carcinoma is over it or near it. In selected cases of low grade cancer, the mandible may be reconstructed immediately by the use of a bone graft. If particular circumstances contraindicate this procedure, the continuity of the mandible may be preserved for a varying period by the use of an intramedullary splint. Such a splint and the later reconstruction by bone graft are most effective if a small portion of upper end of the mandibular ramus has been preserved.

Moreover, the adequate closure of the postoperative defect in the mucous membrane is of sufficient importance to justify removal of a section of the mandible solely to aid the mobilization of the marginal flaps of mucous membrane. In one case failure to do this resulted in undue complications.

Radical excision of cervical nodes in continuity with the primary lesion is recommended. In one case as the result of the failure to obtain complete excision of cervical lymph nodes, in a second operation a node invaded by carcinoma was found in the region of the spinal accessory nerve, which unfortunately had been preserved at the time of the primary operation.

In the surgical excision of extensive lesions of the oral mucous membrane, it may be necessary to provide skin lining at the time of reconstruction. This can be done effectively and relatively rapidly by the use of a temporal flap, rotated in hinge fashion on its base.

There must be more practical adherence to the principles of wide excision for intraoral carcinoma, a principle that cannot be exercised unless important facial structures are sacrificed. Such radical excisional surgery requires thought and plan as to the probable steps of reconstruction before the excisional surgery is carried out.

Immediate or early reconstructive correction of facial defects created by excision of cancer is justified in a high percentage of cases, in fact, in all cases except those in which the carcinoma is highly malignant or in which there is doubt as to whether or not it has been or can be removed completely.

Myron Kaufman

TISSUE REACTIONS AROUND ARTIFICIAL CROWNS

Jens Waerhaug. J. Periodont. 24:172 July 1953.

Two dogs with healthy gingiva were used to study the reaction of the gingiva to artificial crowns situated below the gingival margin. Acrylic crowns were applied to a total of 17 teeth. The observation period varied between 28 and 84 days. After the animals were sacrificed, the jaws were fixed for three days, the crowns were dissolved in chloroform, and the jaws were decalcified and sectioned. By dissolving the acrylic crowns, it was possible to preserve the tissue which in the section had the same appearance as tissue after enamel has been dissolved in acid. Human autopsy material was used in the balance of the study.

The following observations were made from the study of the dogs:

1. Under favorable conditions the epithelium joined closely to the acrylic crowns in the same way as the epithelial attachment joins around a natural tooth. The acrylic crown in itself, therefore, does not appear to cause any significant irritation.

2. On the border between the acrylic crown and the epithelial attachment a membrane was observed which in an ordinary microscope resembled in every way the primary cuticle between the epithelial attachment and the enamel. This finding raises the question whether the so-called primary cuticle belongs to the enamel and whether it is calcified.

3. In some cases a thicker membrane was found between the epithelium and the acrylic crown, and this membrane took horn stain. The question is, therefore, whether the difference between the primary and the secondary cuticle is not quantitative instead of qualitative.

4. Under imperfectly adapted crowns in the space between the crown and the tooth, necrotic tissue was observed which caused irritation of the epithelium and the connective tissue.

5. Wherever large quantities of cement were left behind in the pockets, these acted as a strong irritant. Even the small quantities necessary for filling the space between a well-fitting crown and the tooth had some irritating influence though without the inflammation, which, however slight, causes a deepening of the pocket even under otherwise favorable conditions. A substance with less irritating effect than cement is desirable for this purpose.

6. In one case in which the preparation had passed beyond the bottom of the existing pocket and the crown did not completely cover the prepared region, reattachment was attained all the way to the cervical margin of the crown. It is not probable, therefore, that well-fitting crowns cause an irritation leading to a deepening of the pocket.

Histological investigation of the tissue around ten well-fitting porcelain jacket crowns and five gold crowns which had been removed from human autopsy material led to the following conclusions:

1. There seems to be no striking difference between the reactions of the tissues of dog and man to artificial crowns, nor do the tissues appear to react differently to porcelain, gold and acrylic resins.

2. A well-adapted artificial crown need not cause an irritation leading to a further deepening of the pocket, if the cervical margin of the crown does not come closer than 0.4 mm. to the bottom of the pocket.

3. In practice, therefore, a crown can be prepared as close to the bottom of the existing pocket as is technically possible without severing the periodontal fibers. The requirements for this preparation, however, are a perfect fitting, removal of all living and necrotic tissue between the tooth and the crown before

the crown is cemented, a filling of the entire space with cement, and finally removal of all the excess cement.

4. If the requirements cannot be fulfilled, an artificial crown should not be placed below the gingival margin.

THE EFFECT OF THE SYSTEMIC ADMINISTRATION OF CORTISONE UPON THE PERIODONTIUM OF WHITE MICE

Irving Glickman, Irving C. Stone and Tribhawan N. Chawla. J. Periodont. 24:161 July 1953.

Twenty male and female littermate white mice were studied for the purpose of determining the effect of cortisone on the periodontal tissues.

The following conclusions were drawn: In mice subjected to daily injections with 0.5 mg. of cortisone for periods up to 43 days, microscopic examination of the periodontal tissues revealed osteoporosis of alveolar bone characterized by reduction in the number of osteoblasts and amount of newly formed osteoid matrix, reduction in the height of alveolar bone, edema of the periodontal membrane with reduction in the number of fibroblasts and collagen fibers, and degeneration of the collagen fibers. These changes occurred unrelated to gingival inflammation, which occurred in isolated areas associated with local irritation. The changes in the alveolar bone and periodontal membrane were comparable to those in the bone and periosteum in other areas of the skeletal system.

GROWTH AND TRANSFORMATION OF THE MANDIBULAR JOINT IN THE RAT THYROIDECTOMIZED AT BIRTH

Louis J. Baume, Hermann Becks and Herbert M. Evans. Am. J. Orthodont. 39:623 Aug. 1953.

In order to determine the effect of the thyroid gland on the structure of the mandibular joint, a roentgenographical and histological study was carried out with four groups of experimental rats which were thyroidectomized at birth and killed at 63 days of age. One group served as thyroidectomized controls, another was given pure pituitary growth hormone for 31 days, the third group received thyroxin for the same period of time, and the fourth group was treated with both growth hormone and thyroxin. A group of normal 63 day old rats was used as a normal control group.

The experimental evidence demonstrated that proper mandibular development and good facial pattern are dependent on normal thyroid function. Severe thyroid deficiency during the growth period causes stunting and discordance of the growth processes at the condylar head. Thyroxin supplement is unable to restore full normal dimension, apparently on account of a hypophyseal syndrome which is only partly reversible. Combined treatment with growth hormone and thyroxin showed the best results in the control of thyroprivic symptoms in the mandible.

William F. Ford

TUBERCULOSIS OF THE TONGUE TREATED WITH STREPTOMYCIN AND PAS

E. Robert Wiese. Dis. of Chest 23:582 May 1953.

Tuberculosis of the tongue may well be considered a rarity since less than 500 cases have been reported. Statistics vary considerably as to its incidence, but it is probable that the complication would be reported less rarely if more attention were given to the tongue on examination of the patient.

The onset of the lesion is insidious. The patient may complain of difficulty in articulation and in swallowing; examination may reveal some enlargement and thickening of the tongue. Later a focal point may be localized, and softening may take place which is succeeded by ulceration. Little, if any, pain is felt before ulceration; after ulceration, as a rule, excruciating pain is present continuously.

Tuberculosis of the tongue must be differentiated from toxic glossitis, syphilis, carcinoma and other neoplasms. A thorough physical examination, roentgenograms of the chest and intensive sputum studies should be made. As a rule, tubercle bacilli are not easily demonstrable by histological study of biopsy material.

A case of far advanced bilateral pulmonary tuberculosis was complicated by osteomyelitis of the fourth left metacarpal bone and ulceration of the tongue. The improvement of the pulmonary involvement, the closure of the sinus of the hand and the healing of the ulcer followed the use of streptomycin. A dosage of 250 mg. of streptomycin was administered intramuscularly twice daily for six weeks; then an equal dosage of streptomycin combined with a dosage of para-aminosalicylic acid solution (3 gm. four times a day) was given for 12 weeks.

C. Dean Couch, Jr.

Deaths

Adams, Elmer K., Seattle; Chicago College of Dental Surgery, Loyola University, 1898; died July 9; aged 79.

Akins, George H., Boston; Dental School, Tufts College, 1907; died July 28; aged 76.

Alexander, Paul, Columbus, Ohio; Dental Department, Meharry Medical College, 1923; died June 2; aged 58.

Allen, Frederick C., Boston; Dental School, Tufts College, 1911; died July 26; aged 63.

Allen, Henry W., Kansas City, Mo.; Chicago College of Dental Surgery, Loyola University, 1906; died August 31; aged 72.

Amundson, Christopher L., Waterville, Minn.; College of Dentistry, University of Minnesota, 1903; died September 8.

Anderson, Charles W., Arvonia, Va.; Virginia School of Dentistry, Medical College of Virginia, Richmond, 1902; died May 7; aged 76.

Appel, George, Eatontown, N. J.; Chicago College of Dental Surgery, Loyola University, 1896; died September 15; aged 86.

Arentz, George B., Pittsburg, Calif.; College of Physicians and Surgeons, San Francisco, 1913; died August 16; aged 62.

Arnold, Joseph P., Houston, Texas; Baltimore College of Dental Surgery, University of Maryland, 1900; died July 27; aged 74.

Ashby, Shirley J., Oakland, Calif.; College of Physicians and Surgeons, San Francisco, 1904; died August 22; aged 76.

Axelrad, Benjamin M., New York; Medico-Chirurgical College of Philadelphia, 1915; died July 2; aged 68.

Barrett, George E., East Orange, N. J.; Dental School, Northwestern University, 1939; died September 11; aged 40.

Barton, Burnham D., Boston; Dental School, Tufts College, 1894; died July 29; aged 87.

Berman, Maurice C., Chicago; Chicago College of Dental Surgery, Loyola University, 1932; died August 22.

Bissell, John E. W., Westfield, N. Y.; Philadelphia Dental College, 1890; died August 3; aged 85.

Blass, Derval M., Wisconsin Dells, Wis.; Dental School, Northwestern University, 1900; died May 17; aged 76.

Block, Morris J., East Norwalk, Conn.; School of Dentistry, Temple University, 1932; died September 14; aged 45.

Bode, Armin H., Buffalo; School of Dentistry, University of Buffalo, 1915; died August 13.

Bond, Maurice C., Ithaca, N. Y.; School of Dentistry, University of Pennsylvania, 1919; died July 16.

Boyd, Charles E., Los Angeles; School of Dentistry, University of California, 1919; died August 1; aged 58.

Boyle, William B., Columbia, Pa.; School of Dentistry, Temple University, 1925; died September 22; aged 59.

Breeland, Benjamin H., Holly Hill, S. C.; Atlanta-Southern Dental College, 1936; died July 25.

Bristol, Frank R., Rochester, N. Y.; Baltimore College of Dental Surgery, University of Maryland, 1914; died June 7; aged 63.

Brown, Charles E., Round Hill, Va.; died June 28.

Brown, Morris N., Verona, N. J.; School of Dentistry, Indiana University, 1940; died August 14; aged 40.

Browne, Louis I., Lynn, Mass.; Dental School, Tufts College, 1913; died August 21; aged 66.

Burnley, Richard T., Decatur, Ga.; Atlanta Dental College, 1906; died July 29; aged 75.

Caldwell, Alfred D., Bancroft, Neb.; College of Dentistry, Creighton University, 1907; died May 29; aged 76.

Cameron, Colin, Apollo, Pa.; School of Dentistry, University of Buffalo, 1897; died August 4; aged 80.

Carpenter, Ernest A., Goshen, Ind.; Chicago College of Dental Surgery, Loyola University, 1911; died May 12; aged 76.

Carroll, James C., New Haven, Conn.; Philadelphia Dental College, 1912; died July 26; aged 63.

Casstevens, Hollie E., Greensboro, N. C.; Baltimore College of Dental Surgery, University of Maryland, 1916; died August 10; aged 60.

Chapman, Bert O., Elmira, N. Y.; Philadelphia Dental College, 1891; died August 7; aged 88.

Cichowicz, John J., Lorain, Ohio; School of Dentistry, Western Reserve University, 1930; died August 19; aged 49.

Cochran, Dayton S., San Francisco; Dental School, Northwestern University, 1919; died August 7; aged 59.

Collins, Arthur E., Melrose, Mass.; Dental School, Tufts College, 1918; died July 20; aged 63.

Collins, Frank R., Atlanta, Ga.; School of Dentistry, University of Pittsburgh, 1926; died July 3; aged 50.

Cox, Neclessen S., Miami, Fla.; Ohio College of Dental Surgery, University of Cincinnati, 1892; died August 20; aged 82.

Craig, William E., Pittsburgh; School of Dentistry, University of Pittsburgh, 1918; died October 6; aged 57.

Cummins, Harry R., Chicago; Dental School, Northwestern University, 1908; died May 14; aged 67.

Dalrymple, Ronda H., Hanford, Calif.; College of Dentistry, Baylor University, 1924; died August 17.

De Ceu, William M., Buffalo; School of Dentistry, University of Buffalo, 1903; died June 11.

Deegan, Joseph F., Philadelphia; School of Dentistry, Temple University, 1939; died September 8; aged 38.

DeWager, Emmanuel A., Provincetown, Mass.; Dental School, Tufts College, 1901; died July 13; aged 74.

Dial, Curtis C., Coffeyville, Kan.; Kansas City Dental College, 1903; died August 29; aged 74.

Drumm, Adrian P., Rochester, N. Y.; School of Dentistry, University of Buffalo, 1922; died July 9; aged 55.

Dufner, Jeffie H., San Antonio, Texas; Dental School, Northwestern University, 1917; died August 7; aged 67.

Earle, Plyn, Jackson, Mich.; Dental School, Northwestern University, 1905; died July 12.

Eberhart, Robert O., Mankato, Minn.; Chicago College of Dental Surgery, Loyola University, 1903; died July 31; aged 76.

Epstein, Philip P., Woonsocket, R. I.; Baltimore College of Dental Surgery, University of Maryland, 1909; died July 26; aged 65.

Evans, Fred T., Ferndale, Mich.; College of Dental Surgery, University of Michigan, 1902; died June 1; aged 74.

Fairfax, Henry H., Birmingham, Ala.; School of Dentistry, Vanderbilt University, 1911; died in July.

Farrington, Frederick J., Rahway, N. J.; Philadelphia Dental College, 1905; died September 2; aged 70.

Fenzel, Frank W., Carbondale, Ill.; Department of Dentistry, Starling-Ohio Medical College, 1913; died September 1; aged 63.

Ferrin, Joseph L., Lawrence, Mass.; Dental School, Tufts College, 1915; died August 3.

Finger, George W., McMinnville, Tenn.; School of Dentistry, Vanderbilt University, 1912; died August 5; aged 78.

Fisk, Fred, Chicago; Dental School, Northwestern University, 1900; died August 20; aged 77.

Fitzgerald, John R., San Francisco; College of Physicians and Surgeons, San Francisco, 1929; died September 11; aged 55.

Fitzgerald, Peter B., New Bedford, Mass.; Baltimore College of Dental Surgery, 1912; died August 11; aged 70.

Galbraith, Logan B., Cass Lake, Minn.; Dental School, Northwestern University, 1908; died July 8; aged 69.

Gaut, Frank E., Lakewood, Ohio; School of Dentistry, Indiana University, 1927; died June 17; aged 62.

Gautieri, Michael F., Batavia, N. Y.; Dental School, Tufts College, 1934; died May 31; aged 45.

Gelston, William H., Merchantville, N. J.; Philadelphia Dental College, 1891; died August 9; aged 83.

Gibson, Ben S., Gibson Station, Va.; Louisville College of Dentistry of Centre College, 1908; died July 29; aged 71.

Giger, Gustav A., Paterson, N. J.; Philadelphia Dental College, 1905; died August 19.

Gilhuly, Holmes R., New York; School of Dentistry, University of Pennsylvania, 1918; died July 17; aged 60.

Gilroy, Robert C., Pittston, Pa.; School of Dentistry, Temple University, 1918; died September 19; aged 62.

Goettsche, Rudolph, Higgins, Texas; German-American Dental College, Chicago, 1897; died August 9; aged 85.

Gold, Charles E., Bangor, Pa.; School of Dentistry, University of Pennsylvania, 1904; died August 5; aged 78.

Granof, Jack, Milwaukee; Dental School, Marquette University, 1924; died July 18; aged 52.

Griffith, William D., Minneapolis; College of Dentistry, University of Minnesota, 1935; died July 22.

Grisso, Archa D., Fort Worth; School of Dentistry, University of Colorado, 1923; died August 25; aged 65.

Grossman, Laurence G., Saginaw, Mich.; College of Dental Surgery, University of Michigan, 1911; died June 11; aged 64.

Harrington, Albert A., Newark, N. J.; Baltimore College of Dental Surgery, University of Maryland, 1910; died August 24; aged 65.

Hart, Winthrop F., Redwood City, Calif.; College of Physicians and Surgeons, San Francisco, 1929; died August 6; aged 49.

Haynen, Albert E., Ogdensburg, N. Y.; Pennsylvania College of Dental Surgery, Philadelphia, 1897; died May 15; aged 79.

Hedlund, Elof T., Portland, Ore.; New Orleans College of Dentistry, 1906; died June 16; aged 67.

Henke, Robert A., Chester, Pa.; School of Dentistry, University of Pennsylvania, 1918; died August 21; aged 58.

Henslee, Thomas C., Miami, Fla.; School of Dentistry, Vanderbilt University, 1919; died September 22; aged 56.

Heslin, Thomas E., Dover, N. J.; School of Dentistry, Georgetown University, 1924; died July 12; aged 51.

Hickey, James P., Midland, Mich.; Department of Dental Surgery, Detroit College of Medicine, 1902; died July 17; aged 50.

Hien, Charles J., Woonsocket, R. I.; Baltimore College of Dental Surgery, University of Maryland, 1909; died July 18; aged 69.

Hill, Leander R., Toledo, Ohio; Dental Department, Meharry Medical College, 1920; died July 14; aged 63.

Hlavac, Charles W., New York; New York College of Dentistry, 1912; died July 2.

Hobbs, Wilburn D., Washington, D. C.; School of Dentistry, Georgetown University, 1914; died August 16.

Hopkins, Merle R., Aberdeen, S. D.; School of Dentistry, Washington University, St. Louis, 1899; died June 13; aged 79.

Huber, Ralph, Seattle; School of Dentistry, North Pacific College of Oregon, 1919; died August 31; aged 63.

Hulvey, Donald E., Bloomington, Ill.; Dental School, Northwestern University, 1925; died August 13; aged 51.

Hurdle, Orval N., Mount Sterling, Ill.; School of Dentistry, Washington University, St. Louis, 1916; died May 12; aged 59.

Ide, Ira C., Dundee, N. Y.; Baltimore College of Dental Surgery, University of Maryland, 1903; died June 16; aged 72.

Johnson, Andrew J., Chicago; College of Dentistry, University of Illinois, 1925; died August 2; aged 56.

Johnson, John W., Chicago; Chicago College of Dental Surgery, Loyola University, 1894; died August 27; aged 82.

Johnston, Harry B., Atlanta, Ga.; Atlanta Dental College, 1916; died July 24; aged 73.

Kantro, Jacob M., Tampa, Fla.; New York College of Dentistry, 1908; died August 3; aged 65.

Kauffman, John C., Joliet, Ill.; Dental School, Northwestern University, 1908; died July 27; aged 70.

Kelleher, Charles P., New Orleans; Ohio College of Dental Surgery, University of Cincinnati, 1907; died July 30; aged 67.

Kier, George P., San Diego; College of Dentistry, University of Iowa, 1901; died August 20; aged 74.

Kirkpatrick, Joyce T., Slater, Mo.; Kansas City-Western Dental College, 1925; died August 20; aged 58.

Lakin, Robert T., Boonsboro, Md.; Baltimore College of Dental Surgery, 1899; died July 18.

Lee, Victor D., Birmingham, Ala.; Birmingham Dental College, 1912; died in July; aged 64.

Linger, Freeman S., Clarksburg, W. Va.; Baltimore College of Dental Surgery, 1911; died July 6; aged 69.

Mandell, Alvin A., Brooklyn; College of Dentistry, New York University, 1942; died July 21; aged 35.

Mann, Edward C., Columbus, Ohio; died July 26; aged 84.

Maricle, Hosea J., Wells, Minn.; Dental School, Northwestern University, 1917; died August 10; aged 63.

Martin, Elby D., Memphis, Tenn.; College of Dentistry, University of Tennessee, 1913; died August 21; aged 68.

Maycock, James H., Worcester, Mass.; School of Dentistry, University of Louisville, 1925; died August 2; aged 57.

McAree, Dominick J., Bradford, Mass.; died July 29.

Meredith, Douglas A., Kansas City, Kan.; Western Dental College, Kansas City, 1910; died August 30; aged 69.

Mesjian, Harry A., Philadelphia; School of Dentistry, University of Pennsylvania, 1921; died July 29; aged 53.

Miller, Henry J., Erie, Kan.; Western Dental College, Kansas City, 1914; died June 18; aged 62.

Miller, Jack B., New York; School of Dentistry, University of Pennsylvania, 1937; died August 29; aged 41.

Molyneaux, John, Oxford, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1898; died July 31.

Montgomery, W. Ray, Buffalo; School of Dentistry, University of Buffalo, 1903; died July 31; aged 74.

Montigny, Eric, Detroit; died June 21; aged 57.

Morse, Henry, Brooklyn; College of Dental and Oral Surgery, New York, 1921; died August 6; aged 56.

Mottley, F. Wilbur, Wellesley, Mass.; Dental School, Tufts College, 1919; died September 12.

Munkittrick, Alfred G., Dundee, N. Y.; Baltimore college of Dental Surgery, University of Maryland, 1929; died September 1; aged 54.

Nance, Horace E., Albuquerque, N. M.; Western Dental College, Kansas City, 1919; died June 14; aged 56.

Nugent, Edwin P., Wellington, Kan.; Ohio College of Dental Surgery, University of Cincinnati, 1892; died June 2; aged 85.

Oberg, Alfred T., St. Paul; College of Dentistry, University of Minnesota, 1902; died May 27; aged 73.

Oder, Millard F., Miami, Fla.; Cincinnati College of Dental Surgery, 1912; died May 16; aged 65.

Pankonin, George F., Clark, S. D.; Dental School, Northwestern University, 1914; died June 22; aged 66.

Parsell, William H., Mechanicsburg, Pa.; School of Dentistry, Temple University, 1927; died June 25; aged 49.

Parsonault, Joseph L., Dodge, Neb.; College of Dentistry, Creighton University, 1922; died June 24; aged 55.

Paterno, Jerome A., Jersey City; School of Dentistry, Georgetown University, 1937; died August 16.

Patrick, Bernard F., Iowa City, Iowa; College of Dentistry, University of Iowa, 1936; died June 13; aged 39.

Penney, Clarence J., New York; College of Dentistry, New York University, 1906; died June 3; aged 72.

Pepple, Joseph G., Princeton, Ind.; School of Dentistry, St. Louis University, 1919; died May 3; aged 57.

Pines, Louis, Brooklyn; New York College of Dentistry, 1913; died August 23; aged 62.

Provan, Walter F., Boston; Dental School, Harvard University, 1905; died July 29; aged 72.

Rabil, Robert E., Laurens, S. C.; School of Dentistry, Medical College of Virginia, 1949; died May 24; aged 27.

Rakoff, Morris, New York; New York College of Dentistry, 1923; died July 7; aged 52.

Rankin, Frank W., Muskegon, Mich.; College of Dental Surgery, University of Michigan, 1922; died July 27; aged 55.

Rath, Walter A., Washington, D. C.; New York College of Dentistry, 1920; died August 23; aged 60.

Rausenberger, Charles W., Germantown, Pa.; School of Dentistry, University of Pennsylvania, 1900; died July 19; aged 75.

Reed, Fred C., Cherryvale, Kan.; died July 3; aged 70.

Reed, Herbert A., Dorchester, Mass.; died May 28; aged 78.

Reilly, Richard J., Little Falls, N. Y.; died August 5; aged 56.

Richardson, Charles H., Richmond, Mich.; College of Dental Surgery, University of Michigan, 1916; died July 15; aged 61.

Roat, Albert L., Philadelphia; Philadelphia Dental College, 1897; died September 13; aged 79.

Rochlin, Morris, Belleville, N. J.; School of Dentistry, University of Pennsylvania, 1920; died August 23.

Rogers, Walter F., Erie, Pa.; Philadelphia Dental College, 1898; died May 26; aged 88.

Romano, Alfred A., Chicago; Chicago College of Dental Surgery, Loyola University, 1928; died July 30; aged 47.

Roohan, Leo W., Saratoga Springs, N. Y.; School of Dentistry, University of Pennsylvania, 1917; died October 4; aged 58.

Rotzoll, Paul A., Chicago; College of Dentistry, University of Illinois, 1905; died in August.

Rowsey, John E., Henderson, Tenn.; School of Dentistry, Vanderbilt University, 1901; died June 9; aged 81.

Rumberger, Walter W., Mount Union, Pa.; Philadelphia Dental College, 1905; died May 18; aged 77.

Rushing, Henry C., Eldorado, Ark.; School of Dentistry, Vanderbilt University, 1906; died May 24; aged 71.

Sachs, Samuel C., Chicago; Chicago College of Dental Surgery, Loyola University, 1924; died August 12; aged 57.

Saladana, John J., San Francisco; College of Dentistry, University of California, 1926; died June 15; aged 52.

Salisbury, Erwin A., Ann Arbor, Mich.; College of Dental Surgery, University of Michigan, 1899; died July 16.

Sauby, Orvin, Elbow Lake, Minn.; College of Dentistry, University of Minnesota, 1915; died August 3; aged 61.

Saunders, Charles, Denton, Texas; died June 21; aged 78.

Scheinman, Israel, Lynbrook, N. Y.; New York College of Dentistry, 1925; died July 28; aged 51.

Schlinkmann, John H., Baltimore; Baltimore College of Dental Surgery, 1901; died May 25; aged 81.

Schmidt, Bernard A., Galveston, Texas; School of Dentistry, Loyola University, New Orleans, 1919; died August 10; aged 58.

Shea, Michael J., Pittsfield, Mass.; Dental School, Tufts College, 1917; died June 16; aged 60.

Sherman, Aloyse V., Chicago; Chicago College of Dental Surgery, Loyola University, 1919; died September 29; aged 55.

Shinneman, Percy, Larned, Kan.; Ohio College of Dental Surgery, University of Cincinnati, 1900; died August 13; aged 79.

Slakis, Lawrence P., Chicago; Chicago College of Dental Surgery, Loyola University, 1925; died September 21; aged 53.

Slattery, John J., West Allis, Wis.; Dental School, Marquette University, 1917; died July 19; aged 57.

Slawson, George H., Salem, Mo.; School of Dentistry, St. Louis University, 1907; died June 26; aged 67.

Slone, Warren W., Dade City, Fla.; Southern Dental College, Atlanta, 1915; died September 3; aged 69.

Smith, Guy M., Idaho Falls, Idaho; Chicago College of Dental Surgery, Loyola University, 1910; died May 31; aged 65.

Smith, Junior Manley, State Center, Iowa; College of Dentistry, University of Iowa, 1917; died in June; aged 60.

Smyth, Arthur E., Verona, N. J.; College of Dentistry, Howard University, 1901; died June 8; aged 81.

Sobey, Arthur W., San Francisco; College of Dentistry, University of California, 1904; died September 16; aged 71.

Solomon, Irving J., Englewood, N. J.; School of Dentistry, University of Pennsylvania, 1942; died September 3; aged 40.

Spenadel, Henry, New York; New York College of Dentistry, 1904; died June 8.

Standen, Howard C., Cleveland; School of Dentistry, Western Reserve University, 1903; died July 17; aged 70.

Steele, William C., Chattanooga, Tenn.; School of Dentistry, Vanderbilt University, 1913; died June 25; aged 62.

Stefani, Ferdinand G., Highland Park, Mich.; School of Dentistry, University of Detroit, 1937; died May 31; aged 44.

Stellwagen, Frederick W., Van Nuys, Calif.; Department of Dental Surgery, Detroit College of Medicine, 1900; died May 25; aged 80.

Stevens, James W., Vernal, Utah; Western Dental College, Kansas City, 1916; died May 24; aged 59.

Stone, Norman R., Ida, Mich.; College of Dental Surgery, University of Michigan, 1914; died July 8; aged 67.

Stott, Hubert W., Monmouth, Ill.; Chicago College of Dental Surgery, Loyola University, 1904; died June 27; aged 72.

Strickman, Herbert, Freehold, N. J.; School of Dentistry, Loyola University; New Orleans, 1937; died June 13; aged 43.

Sullivan, John C., Homestead, Pa.; School of Dentistry, University of Pittsburgh, 1925; died August 13; aged 51.

Summerfield, Nate, Chicago; College of Dentistry, University of Illinois, 1915; died July 20; aged 63.

Suter, A. B. W., Collingswood, N. J.; School of Dentistry, University of Buffalo, 1912; died July 2.

Swart, Lloyd V., Woodland, Wash.; School of Dentistry, North Pacific College of Oregon, 1924; died May 17; aged 53.

Taylor, Verla W., Worthington, Ohio; College of Dentistry, Ohio Medical University, 1907; died June 6; aged 71.

Tejml, Emil, Rosenberg, Texas; Texas Dental College, Houston, 1930; died June 22; aged 46.

Thacker, Henry H., Brazil, Ind.; Indiana Dental College, 1901; died July 20.

Theurer, George B., Janesville, Wis.; College of Dental Surgery, University of Michigan, 1903; died August 9; aged 73.

Tolliver, Harry C., Elnora, Ind.; Indiana Dental College, 1909; died July 27; aged 69.

Treitman, Otto, Newark, N. J.; Medico-Chirurgical College of Philadelphia, 1910; died July 1; aged 65.

Trotter, Charles M., North Salem, Ind.; Central College of Dentistry, Indianapolis, 1902; died July 25; aged 83.

Trunnell, Eugene E., Kirksville, Mo.; Western Dental College, Kansas City, 1906; died June 14; aged 68.

Turman, Charles F., Parksley, Va.; Dental Department, University College of Medicine, Richmond, 1899; died August 8; aged 80.

Tyler, Harry E., Adams, N. Y.; Dental Department, Baltimore Medical College, 1909; died August 6; aged 68.

Van Horn, Chris S., Bloomsburg, Pa.; Pennsylvania College of Dental Surgery, Philadelphia, 1894; died August 7; aged 82.

Van Kirk, Lawrence E., Pittsburgh; School of Dentistry, University of Pittsburgh, 1919; died August 26.

Vasko, James D., Omaha; College of Dentistry, Creighton University, 1922; died May 19; aged 54.

Walker, Pren F., Lake Worth, Fla.; College of Dentistry, Ohio State University, 1909; died June 10; aged 68.

Washington, Anthony B., Newark, N. J.; College of Dentistry, Howard University, 1910; died June 22; aged 73.

Wassem, Charles F., Philadelphia; Philadelphia Dental College, 1900; died September 7; aged 79.

Wesley, Frank D., Atlanta, Ga.; Atlanta-Southern Dental College, 1918; died July 27; aged 58.

Wiander, John F., San Francisco; College of Physicians & Surgeons, San Francisco, 1927; died in September; aged 49.

Wick, John H., Charleston, W. Va.; Dental School, Northwestern University, 1908; died August 4; aged 68.

Wood, Edward B., Newton Center, Mass.; died August 12.

Zemba, George W., Westlake, Ohio; died July 30.

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Fifth Annual Session	Nov. 8-11, 1954	Miami
Ninety-Sixth Annual Session	Oct. 17-20, 1955	San Francisco
Ninety-Seventh Annual Session	Oct. 1-4, 1956	Atlantic City, N. J.

MEETINGS OF CONSTITUENT SOCIETIES

State	Date	Place	Secretary	Address
Alabama	Apr. 25-27, 1954	Biloxi, Miss.	F. A. Finney, Jr.	1045 Forrest Ave., Gadsden
Alaska	June 20, 1954	Mt. McKinley National Park	C. J. Pearson	500 K St., Anchorage
Arizona	Apr. 21-24, 1954	Phoenix	E. M. Scott	17 E. Weldon Ave., Phoenix
Arkansas	Apr. 4-7, 1954	Little Rock	D. M. Hamm	Box 89, Clarksville
California	Apr. 26-28, 1954	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	May 3-5, 1954	Los Angeles	J. P. Bowers	124 W. Lime Ave., Monrovia
Colorado	Oct. 3-6, 1954	Colorado Springs	W. R. Humphrey	724 Republic Bldg., Denver
Connecticut	June 2-4, 1954	Hartford	E. S. Arnold	47 Linnard Rd., W. Hartford
Delaware	Jan. 13, 1954	Wilmington	J. C. Baker	Mayfair Apts., Sec. C., 1300 Harrison St., Wilmington
District of Columbia	June 8, 1954	Washington	Z. B. Lloyd	2007 R St., N.W., Washington
Florida	Apr. 25-28, 1954	Daytona Beach	B. S. Carroll	706 Professional Bldg., Jacksonville
Georgia	Oct. 10-13, 1954	Atlanta	J. W. Yarbrough	Bibb Bldg., Macon
Hawaii		Honolulu	J. H. Dawe	810 N. Vineyard St., Honolulu
Idaho	Apr. 29, 30, 1954	Boise	C. G. Hanson	409 11th Ave., S., Nampa
Illinois	May 10-13, 1954	Springfield	P. W. Clopper	623 Jefferson Bldg., Peoria
Indiana	May 17-19, 1954	Indianapolis	E. E. Ewbank	Box 96, Kingman
Iowa	May 3-5, 1954	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 16-19, 1954	Wichita	F. A. Richmond	861 Brotherhood Bldg., Kansas City
Kentucky	Apr. 5-7, 1954	Louisville	A. B. Coxwell, Jr.	1976 Douglass Blvd., Louisville
Louisiana	Apr. 21-24, 1954	Baton Rouge	J. S. Bernhard	2515 Line Ave., Shreveport
Maine	June 28-30, 1954	Rockland	S. M. Gower	Box 27, Skowhegan
Maryland	May 3-5, 1954	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore
Massachusetts	May 3-5, 1954	Boston	H. E. Tingley	12 Bay State Road, Boston
Michigan	Apr. 25-28, 1954	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Feb. 22-24, 1954	St. Paul	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	June 5-8, 1954	Biloxi	B. A. Cohen	906 Plaza Bldg., Jackson
Missouri	June 13-16, 1954	St. Louis	E. D. Suggett	201 Merchants Bank Bldg., Jefferson City
Montana	May 6-8, 1954	Great Falls	R. G. Vedova	Roundup
Nebraska	May 10-12, 1954	Omaha	F. A. Pierson	1112 Federal Securities Bldg., Lincoln
Nevada	June 1954	Reno	O. M. Seifert	506 Humboldt St., Reno
New Hampshire	June 14-15, 1954	Whitefield	F. E. Williams	814 Elm St., Manchester
New Jersey	May 4-6, 1954	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 23-26, 1954	Santa Fe	J. S. Eilar	Medical Arts Square, Albuquerque
New York	May 10-12, 1954	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 16-19, 1954	Pinehurst	R. D. Coffey	Kibler Bldg., Morganton
North Dakota	May 23-25, 1954	Bismarck	V. B. Keltgen	517 de Lendrecie Bldg., Fargo
Ohio			E. G. Jones	185 E. State St., Columbus
Oklahoma	Apr. 20-23, 1954	Oklahoma City	D. Robertson	434 N.W. 13th St., Oklahoma City
Oregon	Mar. 1-3, 1954	Portland	W. H. Hurley	308 Selling Bldg., Portland
Panama Canal Zone	Dec. 8	Balboa	C. F. Atkins	DC, USA, Box 115, Rodman
Pennsylvania	Oct. 5-7, 1954	Pittsburgh	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	Jan. 28-30, 1954	San Juan	F. Ordoñez	1558 Ponce de León Ave., Stop 23, Santurce
Rhode Island	Jan. 17, 19, 20, 1954	Providence	N. G. Migliaccio	1467 Westminster St., Providence

State	Date	Place	Secretary	Address
South Carolina	May 23-25, 1954	Columbia	J. R. Owings	7 Medical Court, Greenville
South Dakota	May 20-22, 1954	Sioux Falls	W. R. Stockstad	Sioux Falls
Tennessee	May 10-12, 1954	Chattanooga	W. L. McCulley	Brown Bldg., Cleveland
Texas	Apr. 25-29, 1954	Dallas	W. Ogle	3607 Gaston Ave., Dallas
Utah	Apr. 8-10, 1954	Salt Lake City	K. L. Dedekind	914 Medical Arts Bldg., Salt Lake City
Vermont	May 16-18, 1954	Woodstock	W. J. Reardon	18 Madison St., Rutland
Virginia	Apr. 12-14, 1954	Richmond	W. T. McAfee	705 Colonial National Bank Bldg., Roanoke
Washington	Mar. 25-27, 1954	Seattle	W. B. Martin	Medical-Dental Bldg., Seattle
West Virginia	July 25-28, 1954	White Sulphur Springs	G. N. Casto, Jr.	710½ Lee St., Charleston
Wisconsin	Apr. 20-22, 1954	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming	June 20-23, 1954	Rock Springs	T. J. Drew	State Office Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

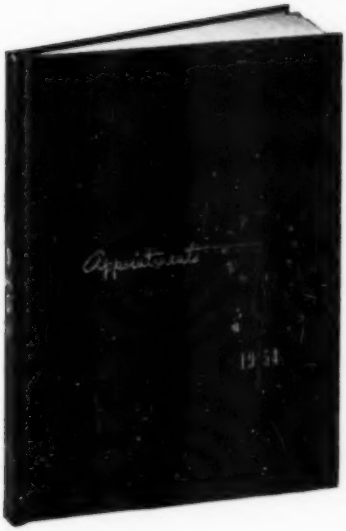
State	Date	Place	Secretary	Address
Alabama	June 21-24, 1954	Birmingham	N. E. Allen	DuBose Bldg., Selma
Alaska			P. H. Williams	Box 2122, Juneau
Arizona			R. K. Trueblood	107 East A Ave., Glendale
Arkansas			H. O. Weatherly	205 Halter Bldg., Conway
California	Feb. 8, 1954	San Francisco	K. I. Nesbitt	507 Polk St., San Francisco
	June 21, 1954	Los Angeles		
	July 26, 1954	San Francisco		
Colorado	June 21-25, 1954	Denver	C. K. Phillips	724 Republic Bldg., Denver
Connecticut			C. G. Brooks	402 State St., New London
Delaware			P. K. Musselman	143 W. Main St., Newark
District of Columbia			W. T. Birthright	1835 Eye St., N.W., Washington
Florida	July 12-22, 1954*†	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia			S. H. Yarbrough	12 Medical Arts Bldg., Columbus
Hawaii			H. L. Houvener	427 Dillingham Bldg., Honolulu
Idaho			R. E. Blickenstaff	1023 Fourth St., S., Nampa
Illinois			W. A. McKee	503 Wood Bldg., Fenton
Indiana			C. A. Frech	504 Broadway, Gary
Iowa	May 24-28, 1954*†	Iowa City	D. J. FitzGerald	615 Brick & Tile Bldg., Mason City
Kansas	Jan. 18-21, 1954*†		G. L. Teall	Box 71, Hiawatha
Kentucky	June 7-10, 1954	Louisville	R. M. Justice	1330 Central Ave., Ashland
Louisiana			R. C. Steib	833 Maison Blanche Bldg., New Orleans
Maine			R. A. Derbyshire	Box 387, Skowhegan
Maryland			H. Levin	3429 Park Heights Ave., Baltimore
Massachusetts			R. A. Barrette	Rm. 33, State House, Boston
Michigan	Jan. 24-30, 1954	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit
	June 6-12, 1954			
Minnesota	Jan. 4-8, 1954	Minneapolis	M. G. Walls	1470 Lowry Medical Arts Bldg., St. Paul
	June 14-18, 1954			
Mississippi	Jan. 4-6, 1954	Jackson	J. C. Boswell	508 Lamar Life Bldg., Jackson
	June 15-17, 1954			
Missouri			R. R. Rhoades	414 Central Trust Bldg., Jefferson City
Montana			V. J. Quinn	301 Phoenix Bldg., Butte
Nebraska			H. E. Weber	1210 Federal Securities Bldg., Lincoln
Nevada	Dec. 7	Las Vegas	R. Whitehead	Suite 6, Masonic Temple, Reno
New Hampshire			D. J. Freese	4 Wall St., Concord
New Jersey	Dec. 3-4*	Trenton	W. A. Wilson	150 E. State St., Trenton
New Mexico			J. J. Clarke, Sr.	Artesia
New York	Feb. 11, 1954†‡		D. W. Beier	23 S. Pearl St., Albany
	Feb. 11, 12, 1954*‡			
	Feb. 16, 17, 1954†‡			
	Feb. 16-19, 1954*‡			
North Carolina	June 28-July 2, 1954	Chapel Hill	F. O. Alford	1109 Liberty Life Bldg., Charlotte
North Dakota	July 12-16, 1954	Fargo	A. L. Pushor	Lisbon
Ohio			H. B. Smith	346 E. State St., Columbus
Oklahoma			R. P. Keidel	403 Surety Bldg., Muskogee
Oregon	Dec. 7-10	Portland	F. L. Utter	506 Pioneer Trust Bldg., Salem
Pennsylvania			A. M. Stinson	Dept. of Public Instruction, Box 911, Harrisburg
Puerto Rico			J. Mercado C.	Box 3717, Santurce
Rhode Island			F. M. Hackett	267 Academy Ave., Providence

State	Date	Place	Secretary	Address
South Carolina			T. C. Sparks	1515 Pickens St., Columbia
South Dakota			H. T. Aker	Canton
Tennessee	Dec. 14‡	Memphis	F. S. Maxey	804 Bennie Dillon Bldg., Nashville
Texas			R. T. Weber	412 Capital National Bank Bldg., Austin
Utah			N. E. Munk	201 Cache Valley Bank Bldg., Logan
Vermont			F. A. Reid	Windsor
Virginia			J. M. Hughes	715 Medical Arts Bldg., Richmond
Washington			M. L. Mower	National Bank of Commerce Bldg., Olympia
West Virginia			C. A. Laughlin	613 Prunty Bldg., Clarksburg
Wisconsin	Jan. 11-15, 1954*†	Milwaukee	S. F. Donovan	Tomah
Wyoming			W. A. Hocker	212 O & S Bldg., Casper

*Dental examination. †Dental hygiene examination. ‡Write to secretary of dental examining board for information on locations of examinations. §Approximate dates—verify with state dental examining board.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
Academy of Denture Prosthetics	Apr. 11, 1954	Miami Beach, Fla.	I. L. Furnas Secy.	928 Silverado St., La Jolla, Calif.
American Academy of Dental Medicine	Dec. 6	New York	W. M. Greenhut Secy.	124 E. 84th St., New York
American Academy of Implant Dentures	Feb. 7, 1954	Chicago	P. S. Loechler Secy.	1924 Thomas Lane, Augusta, Ga.
American Academy of Oral Pathology	Feb. 7, 1954	Chicago	J. L. Bernier Secy.	Armed Forces Institute of Pathology, 7th St. and Independence Ave., S.W., Washington, D.C.
American Association for the Advancement of Science, Subsection on Dentistry	Dec. 29	Boston	R. W. Bunting Secy.	School of Dentistry, University of Michigan, Ann Arbor, Mich.
American Association of Dental Schools	Mar. 22-24, 1954	French Lick Springs, Ind.	M. W. McCrea Secy.	Baltimore College of Dental Surgery, University of Maryland, Baltimore
American Association of Orthodontists	May 16-20, 1954	Chicago	F. A. Squires Secy.	Medical Centre, White Plains, N. Y.
American Board of Orthodontics	May 11-15, 1954	Chicago	C. E. Martinek Secy.	661 Fisher Bldg., Detroit
American Board of Prosthodontics	Feb. 1-7, 1954	Kansas City, Mo.	S. H. Payne Secy.	University of Buffalo, School of Dentistry, Buffalo
American Denture Society	Feb. 6, 7, 1954	Chicago	A. L. Roberts Secy.	Aurora National Bank Bldg., Aurora, Ill.
American Society of Oral Surgeons	Nov. 3-6, 1954	Miami, Fla.	R. F. Whalen Exec. Secy.	1112 E. Clay St., Richmond, Va.
Chicago Dental Society	Feb. 7-10, 1954	Chicago	K. S. Richardson Exec. Secy.	30 N. Michigan Ave., Chicago
Council on Dental Education, Dental Aptitude Tests	Mar. 5, 6, 1954		S. Peterson Secy.	222 E. Superior St., Chicago
Dallas Mid-Winter Dental Clinic	Jan. 24-27, 1954	Dallas	W. C. McCaskill, Jr. Chm.	1329 Medical Arts Bldg., Dallas, Texas
Denver Dental Association, Midwinter Meeting	Jan. 10-13, 1954	Denver	H. L. Harris Secy.	724 Republic Bldg., Denver
District of Columbia Dental Society Fall Graduate Clinic	Mar. 14-17, 1954	Washington	Z. B. Lloyd Secy.	2007 R St., N.W., Washington
Federation Dentaire Internationale	June 10, 1954	The Hague, Netherlands	G. H. Leatherman Secy. Gen.	35, Devonshire Place, London W.1, England
Greater New York Dental Meeting	Dec. 7-11	New York	M. Purdy Exec. Secy.	Hotel Statler, Room 106A, New York
Greater Philadelphia Annual Meeting	Feb. 4-5, 1954	Philadelphia	R. Adams Secy.	137 Bellevue-Stratford Hotel, Broad and Walnut Sts., Philadelphia
International Association for Dental Research	Mar. 19-21, 1954	French Lick, Ind.	E. H. Hatton Secy.	311 E. Chicago Ave., Chicago
National Board of Dental Examiners	Dec. 7, 8		G. J. Casey Secy.	222 E. Superior St., Chicago
Ninth Pacific Coast Dental Conference	June 1-5, 1954	Banff, Alberta, Can.	H. B. Powell Secy.	Greyhound Bldg., Calgary, Alberta, Can.
Pan American Odontological Association	Dec. 9	New York	B. B. Palmer Exec. Secy.	120 Wall St., New York
Southeastern Academy of Prosthodontics	Mar. 20, 21, 1954	Atlanta, Ga.	R. W. Durham Secy.	1001 Bankers Insurance Bldg., Macon, Ga.
Southern Academy of Oral Surgery	Mar. 12-14, 1954	Savannah, Ga.	R. F. Sullivan Secy.	118 Jones St., E., Savannah, Ga.
Thomas P. Hinman Mid-Winter Clinic	Mar. 21-24, 1954	Atlanta, Ga.	S. Holbrook Exec. Secy.	15 Peachtree Place, N.W., Atlanta, Ga.



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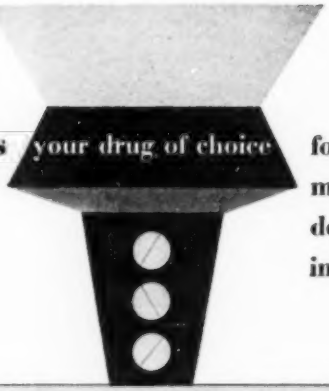

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Group D		A	— combine — A	B	C
Other Groups		A		B	B
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Staphylococcus	B	A	B	A	B
Pneumococcus	B	A		B	B
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Enclosed is _____ for _____ sets A.D.A. L2, filing cases at 75c per set

name _____

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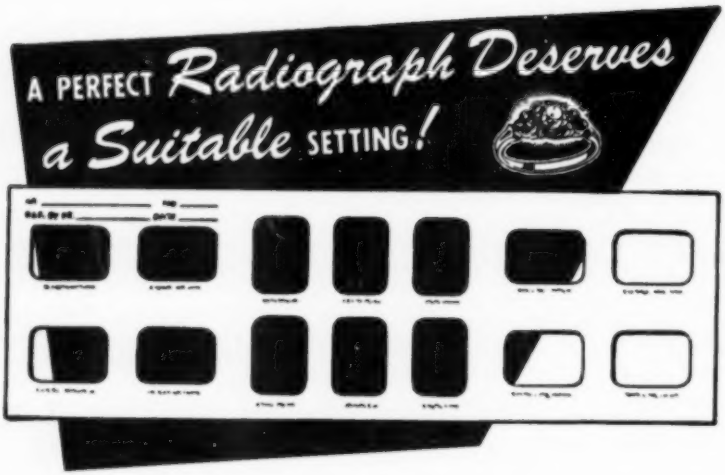

Another RINN product for better X-Ray! **EEZEE-MOUNTS** were first designed to improve FILING . . . PROTECTION . . . HANDLING . . . VIEWING . . . and all at moderate COST! Their exclusive, TRIPLE-LAYER construction of durable quality fibreboard . . . their simplified method of insertion helped to accomplish these aims. BUT . . . another fine feature emerged with the creation of RINN EEZEE-MOUNTS . . . *good looks!* For here is the perfectly shaped frame . . . a setting of color and surface texture that interposes just the right contrast, making each X-Ray picture more attractive . . . and easier to study with a minimum of eye strain.

RINN X-RAY FILM. Standard Full "gray scale" tone ranges disclose ALL conditions
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RINN HANGERS. Minimum clip-to-film contact Super-grip quickly released All sizes Chemical proof
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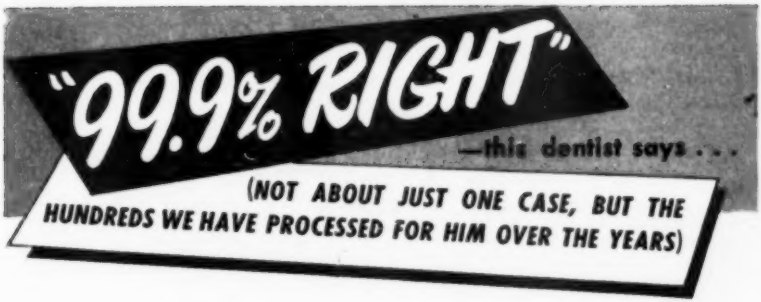

● The point we want to emphasize in quoting this enthusiastic comment from a West Virginia customer is that most of the cases he entrusts to us are *cast removables*. For this reason, the quoted phrase is made all the more significant by its context:

> "... I deeply appreciate all the beautiful exacting work that you have made for my patients in the past years. I truly believe if I could check every case they would average 99.9% *right* ..."

True, this could be said only because the preparations he sent us were 100 per cent right. But it also is convincing evidence of the precision with which the dentist's skill is matched by the Dresch-developed REPLICAST technic in processing all types of cast removables, as well as metal-base full dentures.

Yet these precision-cast appliances cost no more—often even less—than comparable cases produced by the customary empirical methods. Mail the coupon or write for further information.

REPLICAST ... A METHOD ... NOT A MATERIAL

The Dresch Laboratories Company
1009 Jackson Street—Toledo 1, Ohio

Tell me more about 'REPLICAST' precision removables.

Dr._____

*Street Address*_____

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COST HAS NEVER EXCEEDED AMOUNTS SHOWN

ALSO HOSPITAL INSURANCE

	Single	Double	Triple	Quadruple
60 days in Hospital	5.00 per day	10.00 per day	15.00 per day	20.00 per day
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Laboratory Fees in Hospital	5.00	10.00	15.00	20.00
Operating Room in Hospital	10.00	20.00	30.00	40.00
Anesthetic in Hospital	10.00	20.00	30.00	40.00
X-Ray in Hospital	10.00	20.00	30.00	40.00
Medicines in Hospital	10.00	20.00	30.00	40.00
Ambulance to or from Hospital	10.00	20.00	30.00	40.00
COSTS (Quarterly)				
Adult	2.50	5.00	7.50	10.00
Child to age 19	1.50	3.00	4.50	6.00
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$4,000,000.00 INVESTED ASSETS

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- **PRAISED AND PREFERRED** as the "common-sense" dental system for more than 20 years. PRICE: $7.25 for calendar year. Satisfaction guaranteed.

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SPECIAL OFFER

With each purchase of two dozen Indian Head Mouth Mirrors we will supply free, one bottle Anti-Fog—(Value $1.25) Anti-Fog—A new preparation designed for dental use to prevent fogging of mirrors. Apply on surface of mirror, and mirror will not fog.

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NEW OPPORTUNITIES in DENTISTRY for CHILDREN

By treating more children you realize income from a vast new market and you perform a vital health service

Today there are over 31,000,000 children under the age of 12 in America. This year approximately 4,000,000 new babies will join our population. This large and expanding population group demands countless commodities and services, and dentistry for children is becoming a most essential requirement. To meet this demand you need modern materials and techniques to operate efficiently and economically. Rocky Mountain's new specialties meet these requirements, making it possible to care for more children needing your help.

TRU-FORM PRIMARY CROWNS. Authorities estimate that 244,000,000 fillings would be required to restore mouth health to American children of 6-18. Previously little work was done with primary teeth, because conventional materials made care difficult and unprofitable. Now, with Rocky Mountain's new crowns, you can successfully restore badly decayed children's teeth in one sitting at a great saving to you and your patient. Tru-Form Primary Crowns, $.30 each. Introductory assortment of 100 $30.00.

TRU-CHROME SPACE MAINTAINERS. Many serious orthodontic problems are caused by the premature loss of primary teeth and the closing of space. Making a space maintainer is a simple operation with Rocky Mountain prefabricated bands and space maintainers. Rocky Mountain Space Maintainer Kit, $5.25.

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For information contact your dealer or check the technique literature desired and mail the coupon.

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Send FREE folders checked.

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address

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Forms close on 25th of second month preceding month of issue.

Remittance Must Accompany Classified Ads.

Effective with the January issue classified advertising rates will be as follows:

30 words, or less—per insertion $4.00

Additional words, each ..... .10

Answers sent c/o American Dental Association ..... no extra charge

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IOWA—For sale. Well established dental practice. Top location in county seat, population 7500. Owner recalled to service. Write H. F. Timmins, Cherokee, Iowa.

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MINNESOTA—For sale. Beautiful, modern residential, two chair dental office. Established 30 years. Ideal location, between St. Mary's Hospital and Mayo Clinic. Direct replies Dr. H. H. Pesch, 620 Second St. S.W., Rochester, Minn.

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NEW JERSEY—For sale or rent. Practice and home of recently deceased dentist. Established 22 years. Two operating rooms, x-ray, Ritter unit, motor chair, operative instruments, etc. Practice in industrial section of Camden, N. J. Major portion of practice prosthetics, great drawing area. If necessary office and equipment can be rented separately. Direct replies to Mrs. P. J. Chinappi, 1718 Broadway, Camden, N. J.

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NEW YORK—For sale. Practice and office near Rochester. Pleasant office in beautiful prosperous, industrialized village. Three chair, well-equipped office. Reasonable. Owner now specializing. Little competition. Excellent opportunity for highly trained general practitioner. Address A.D.A. Box No. 554.

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NEW YORK—For sale. Modern building, containing dental offices with three additional apartments, suitable for homes or offices, in excellent location. $28,000. Schenectady, N. Y. Address A.D.A. Box No. 555.

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FLORIDA—Associate wanted for pedodontic practice in bungalow office with two well established men in general practice. Must be draft exempt and have Florida license. Write, giving complete qualifications in first letter. Address A.D.A. Box No. 540.

•

FLORIDA—Wanted. Dentists, licensed in Florida; one for Jackson County (Marianna); one for Dade County (Miami); and one for State Mobile Dental Unit. Starting salary $500. Liberal expense allowance for Mobile Unit. Excellent opportunities for promotion and salary increase. Generous retirement and leave provisions. Write Florida State Merit System Director, W. V. Knott Building, Tallahassee, Fla.

INDIANA—Associate, leading to half ownership, or will sell 3 chair office, all Ritter equipment, one office only, 1 year old, x-ray, American cabinets, Castle lights, 3 new swivel stools, completely air conditioned. The most prominent corner, long lease, population 62,000. A Professional Budget Plan office. Will help finance, also will work for you until established. Address A.D.A. Box No. 557.

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INDIANA—Associate wanted; Indiana license. Large established practice. Modern, air-conditioned offices. Permanent position for competent operator wishing to practice general dentistry. Address A.D.A. Box No. 558.

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MICHIGAN—Licensed or Board qualified dentists for public health work in Michigan. Duties are clinical and educational. Must be draft exempt and under 40 years of age. Direct inquiries to Child Health Division, Children's Fund of Michigan, 660 Frederick St., Detroit 2, Mich.

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NEW YORK—Associate for orthodontic practice, percentage basis; object partnership. Must be draft exempt. Upstate New York. Send full particulars in first letter. Address A.D.A. Box No. 559.

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PENNSYLVANIA—Orthodontic associate. A growing practice of 500 active cases and 300 in retention available in northern Pennsylvania. The opportunity of a lifetime for the right person. Orthodontic experience desirable, but not necessary. Address A.D.A. Box No. 560.

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PENNSYLVANIA—Oral surgery internship, January 1, 1954, for one year. Now available at the Hospital of the University of Pennsylvania, Philadelphia 4, Pa. Apply to either the Director of the hospital or the Chief of the Department of Oral Surgery.

•

SOUTH CAROLINA—Dentist wanted, licensed now or capable of securing license in South Carolina. Write State Training School, Clinton, S. C.

LOCATIONS AVAILABLE

CALIFORNIA—For rent or lease new 4 chair dental clinic. Building now under construction. Arizona Street Medical Center, 3821 Arizona St., San Diego 4, Calif.

CONNECTICUT—Dental bungalow, sharing reception room with chiropodist, located main street, edge of business center. Also modern dental equipment, instruments and practice available. Direct replies to Dr. Eugene M. Gane, 1010 Farmington Ave., West Hartford 7, Conn.

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Oral surgeon seeks permanent pleasant partnership. Excellent training, background and personality. Will invest financially; will take State Board. Address A.D.A. Box No. 564.

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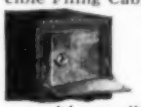

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"OPERATION MAGNETIC" SPECIAL OFFER!

Build your own **demonstration** set of **esthetic** (no ugly metal exposed) **magnetic dentures,** mount them on a handsome plastic articulator and use them to demonstrate **magnetic repulsion** in **dentures** to your patients! **YOU NEED:**

1x16 **Prefabricated Magnetic** Posterior Teeth* (magnets included) ..... list $35.00
(U.S. Patent #2,616,174)
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1 All-plastic **Articulator** ..... list 6.00
Simple instructions included

Total list price $45.00

All for the low special* price of $36.00
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To insure
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Mouth changes can't be prevented – but *denture changes should be* – if many refitting problems are to be avoided. "Six-months-after", it's distressing to find delicately molded ridges worn away, and the denture's meticulous fitting destroyed, by harsh abrasive scrubbing.
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All Certified Repelling Magnets are of the strongest magnetic material obtainable and **are shipped magnetized** for the maximum repelling action.

All Certified Repelling Magnets are covered with a pink moisture proof coating. (No. 22 available white or pink).

All Certified Repelling Magnets may be reshaped by grinding with grey or red dental stones and the coating should be replaced.

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Certified Repelling Magnet—Rod Shape—1 1/16" Length, 3/16" Diameter.
Set of four magnets ..... $ 4.65

No. 22
Certified Repelling Magnet—Square Bar Shape—1" Length, 3/16" Square.
Set of four magnets ..... $ 6.25
(Available with pink or white coating)

No. 69
Certified Repelling Magnet—U Shape—1" Length, 1/4" Wide, 5/16" High. Repelling force guaranteed for ten years.
Set of four magnets $14.85

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No. 69 is the strongest repelling size and shape. Its design maintains maximum repelling action for the longest period of time. Should be used whenever space permits, for the best stabilizing result.

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NO. 69 PLASTIC DEMONSTRATION ARTICULATOR—
The repelling action of magnetic dentures is effectively demonstrated with this articulator. Can be used to display any full set of dentures.
Transparent, Each ..... $ 4.80
Colors—Pink, Yellow, Blue, Tan, Each ..... $ 5.50
(Price does not include dentures)

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Especially made to control magnets during waxing of magnets to the buccals of dentures for patient demonstration.
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Order from your dental supply house or direct. We distribute repelling magnets; all sizes, all shapes and all materials.

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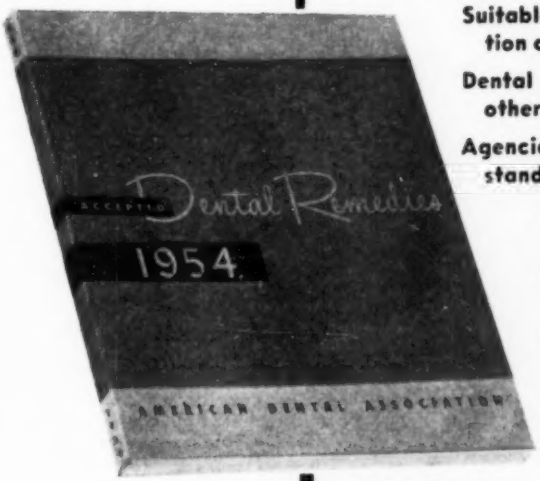

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• • •

It's an ironic fact that it required a tragedy to preserve to historical fame the name of one William Dinley, one of the first "physician-dentist" imports of Boston from England. In 1630 Dinley and two other barber-surgeons hazarded the trip to the new country; and theirs was the first recorded dental practice in what was to become the United States. In 1638, at the height of a violent snow storm, Dinley lost his way en route to a toothache sufferer, and was later found frozen to death. The incident put his name on record for posterity; but his associates apparently died in bed, without reknown.

• • •

The problems of socialized dentistry truly are infinite. For instance, if a patient's dentures break while she is champing an apple, who pays for the replacements? The State! says the hardy London Executive Council. Ah, but what if the patient leaves his chewers in a glass of water and a dog bounds through an open window and chews them . . . or what if the patient, gloating over his dentures to his wife, drops them in the fire . . . or loses them while bathing in the surf . . . ? Then, says the Council with nice judicial instinct, the patient pays!

• • •

The popular "do-it-yourself" trend in home repair and decoration seems to be finding its echo even in dental practice. Back in 1946, only 38% of all laboratory work (including bridges, inlays and denture work) was being done in dental offices—the balance being sent out to commercial laboratories. In 1953, according to a current survey, this figure has risen four points—to 42%.

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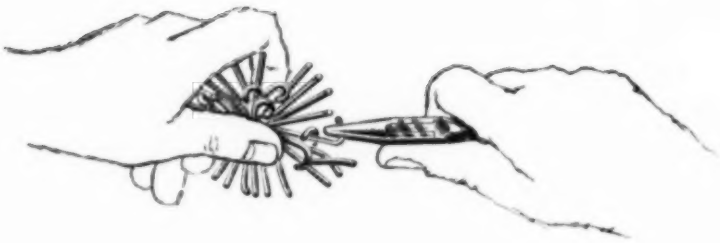

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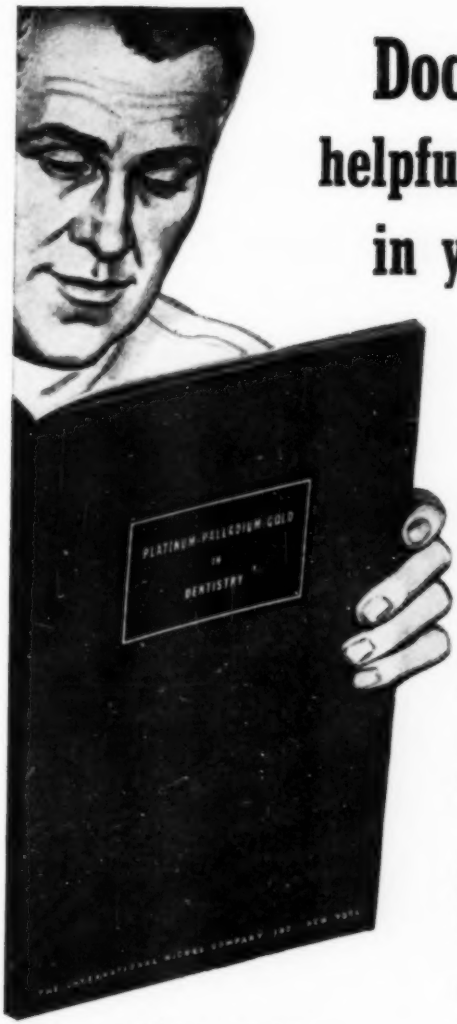

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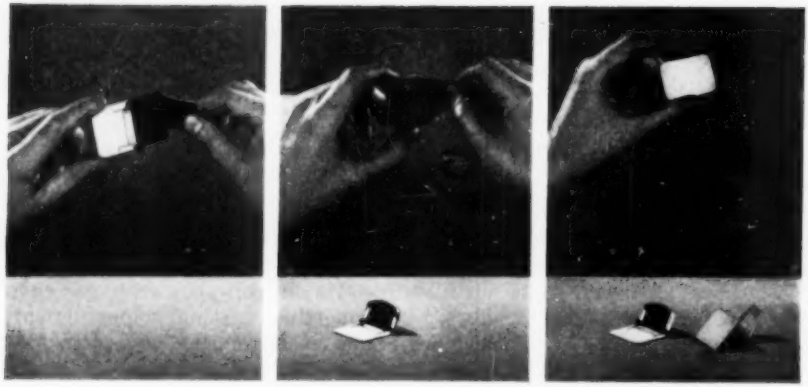

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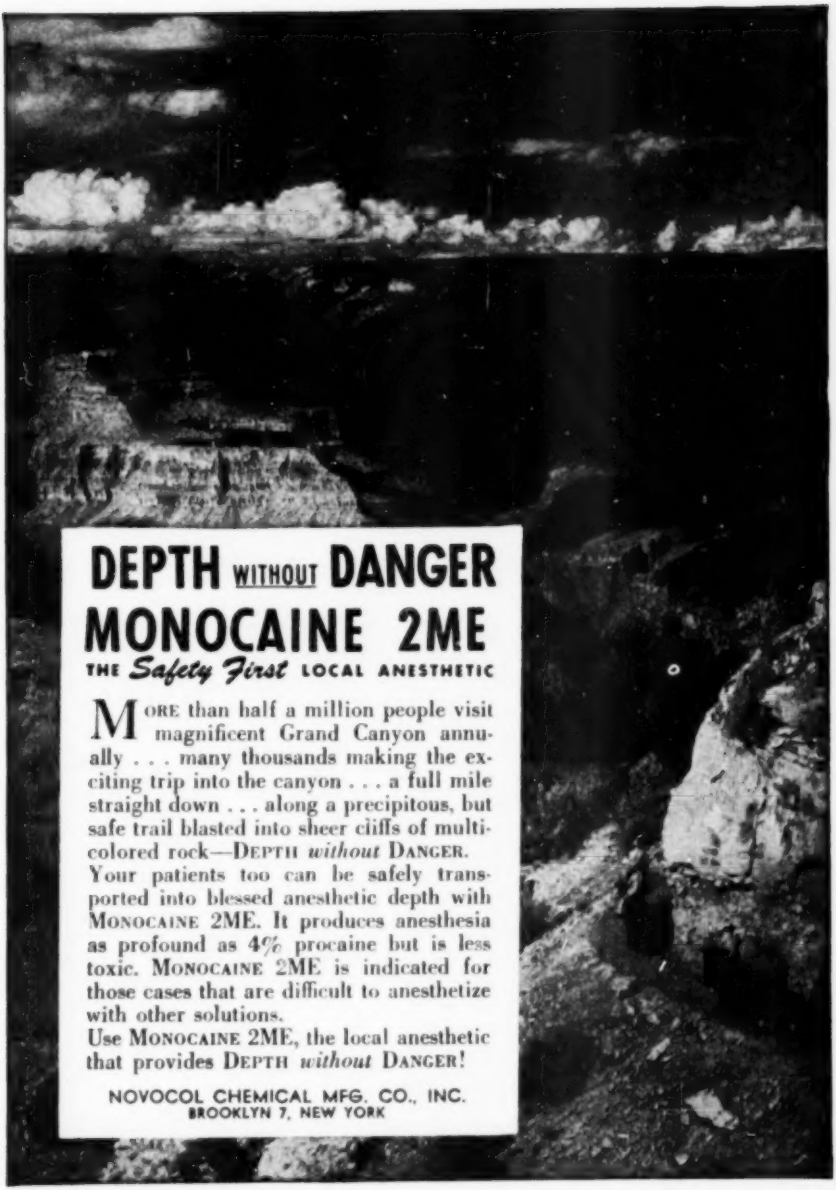

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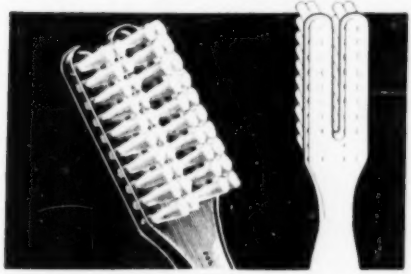

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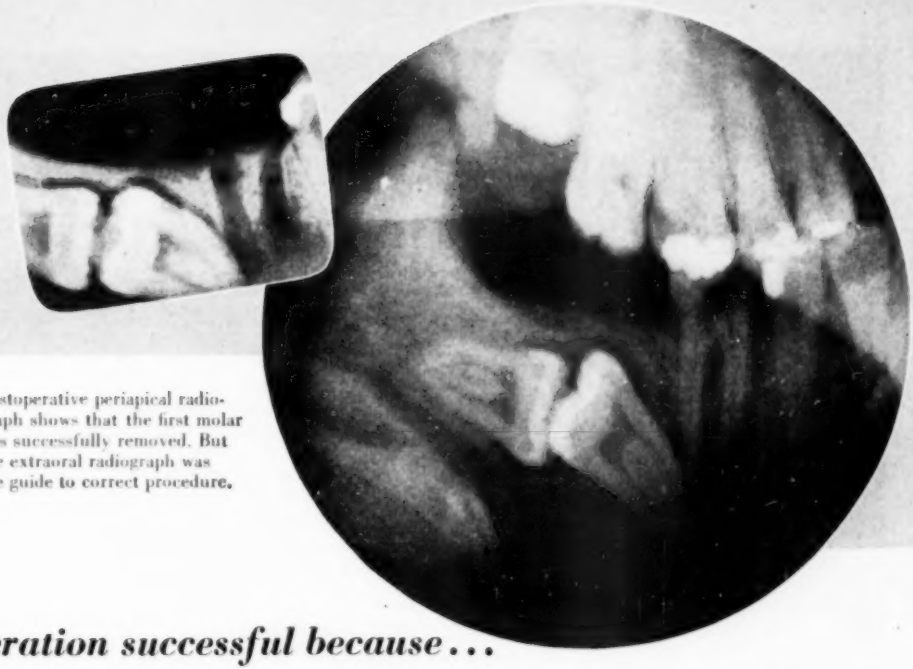

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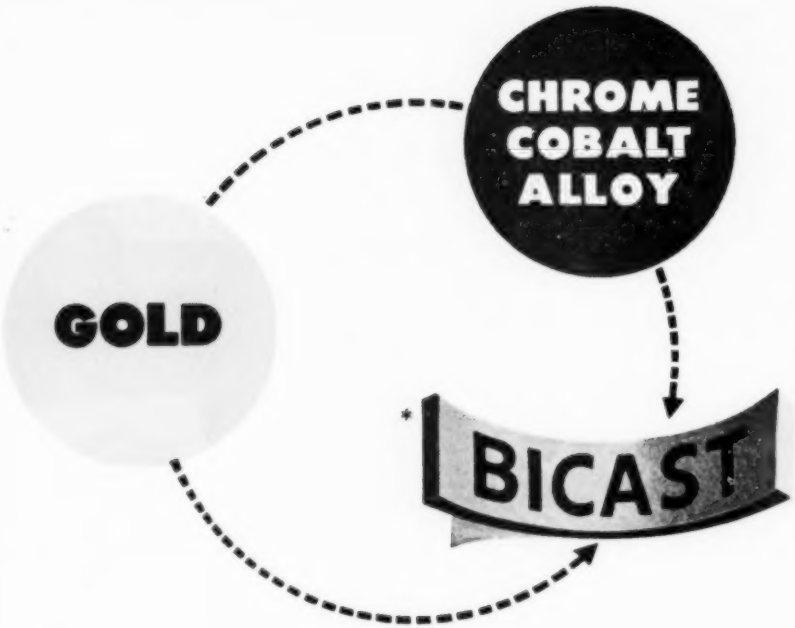

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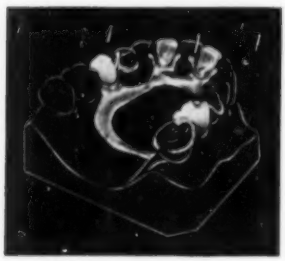

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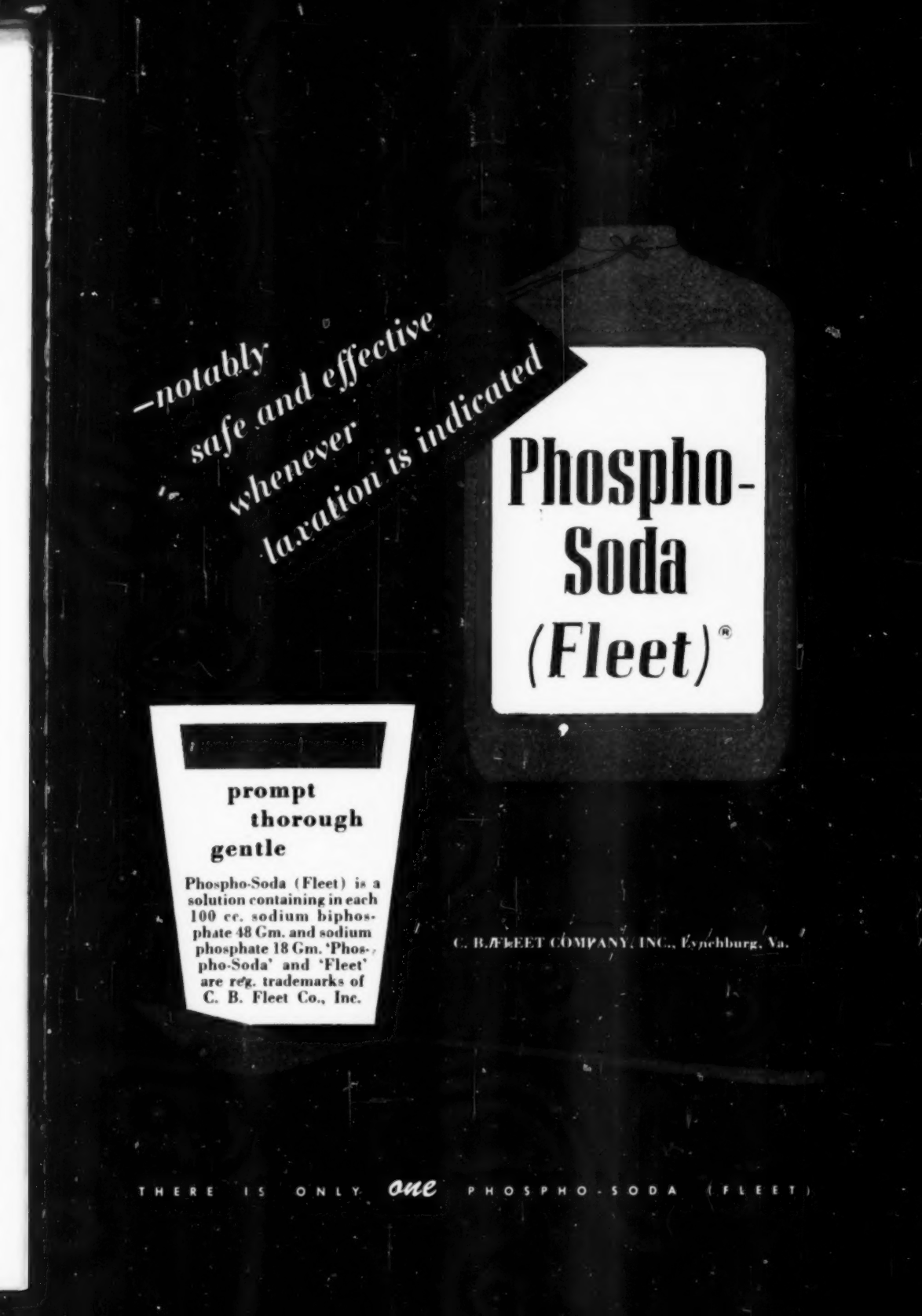
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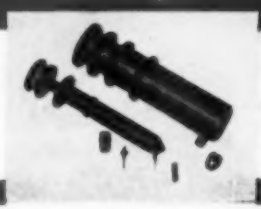

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